

## **BASELINE GROUND WATER MONITORING REPORT**

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Federal Center South  
4735 East Marginal Way South  
Seattle, Washington

Prepared for

U.S. General Services Administration  
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## Introduction

This report presents the results of eight quarters of ground water monitoring as a followup to underground storage tank and contaminated soil removal at the Federal Center South facility in Seattle, Washington. The facility is located at 4735 East Marginal Way South (Figure 1), along the eastern riverbank of the Duwamish Waterway within the industrial portion of South Seattle. It is owned and managed by the U.S. General Services Administration (GSA). The removed tanks included a 12,000-gallon gasoline tank used to provide fuel for motor pool vehicles and a 1,000-gallon waste oil tank used for storage of fluids resulting from motor pool vehicle maintenance.

Limited exploration during the tank removal process indicated a gasoline release beneath a former fuel dispenser unit, extending approximately 30 feet to the south and west. Approximately 100 feet south of the gasoline tank, a waste oil tank also was found to have released diesel and heavy oil to soil immediately surrounding the tank. Initial contaminant characterization indicated that polychlorinated biphenyls (PCBs), halogenated volatile organics, polycyclic aromatic hydrocarbons (PAHs), and metals were not of concern and have not been further analyzed.

The site ranges 5 to 10 feet above mean sea level, consisting of a relatively level concrete/asphalt parking lot and several multi-story office and warehouse buildings. No soil is exposed to the surface at any place in the site vicinity. The layout of the former tanks, monitoring well locations, and surrounding site features pertinent to this project are shown in Figures 2 and 3.

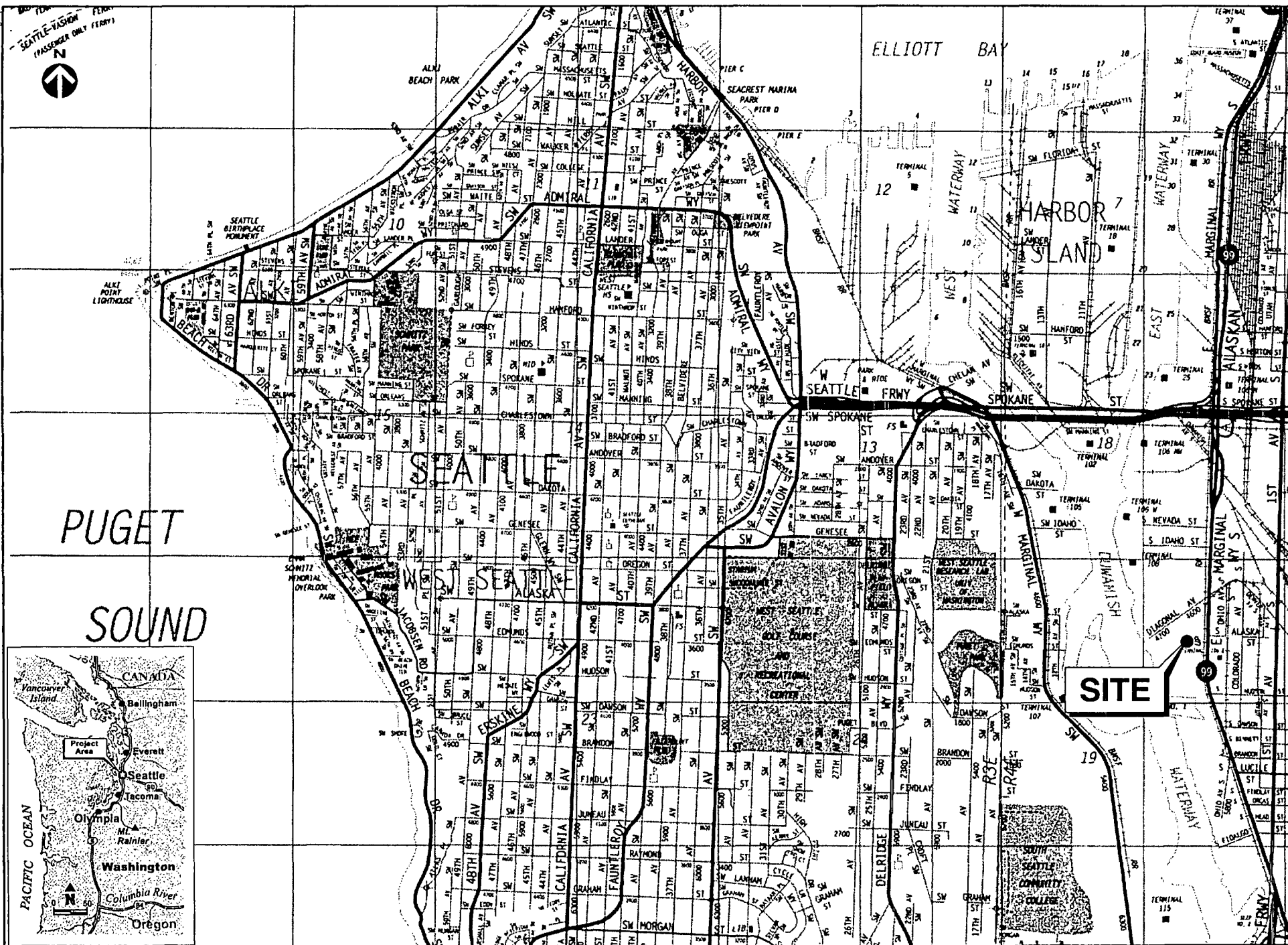


Figure 1. Vicinity map, Federal Center South, Seattle, Washington.

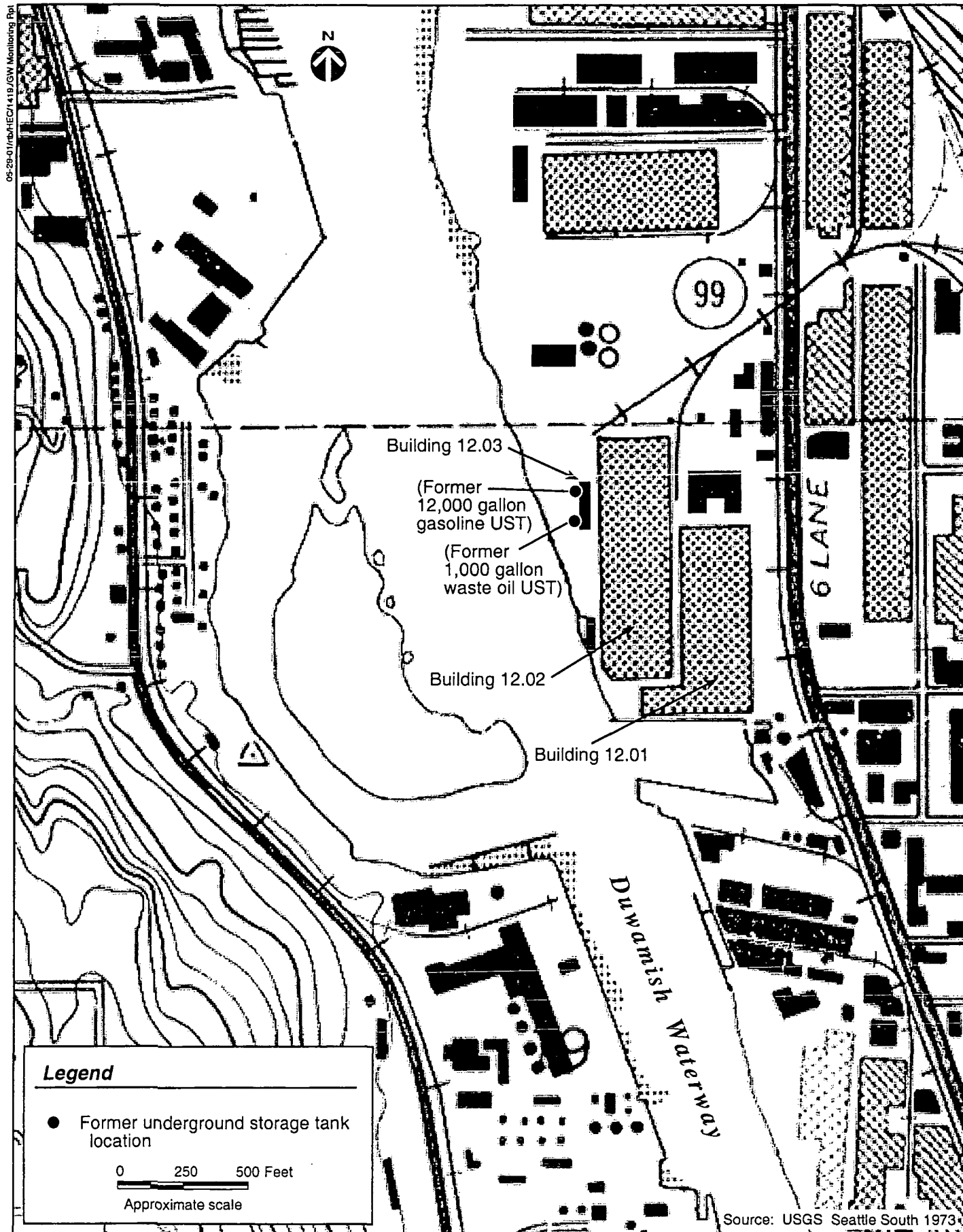
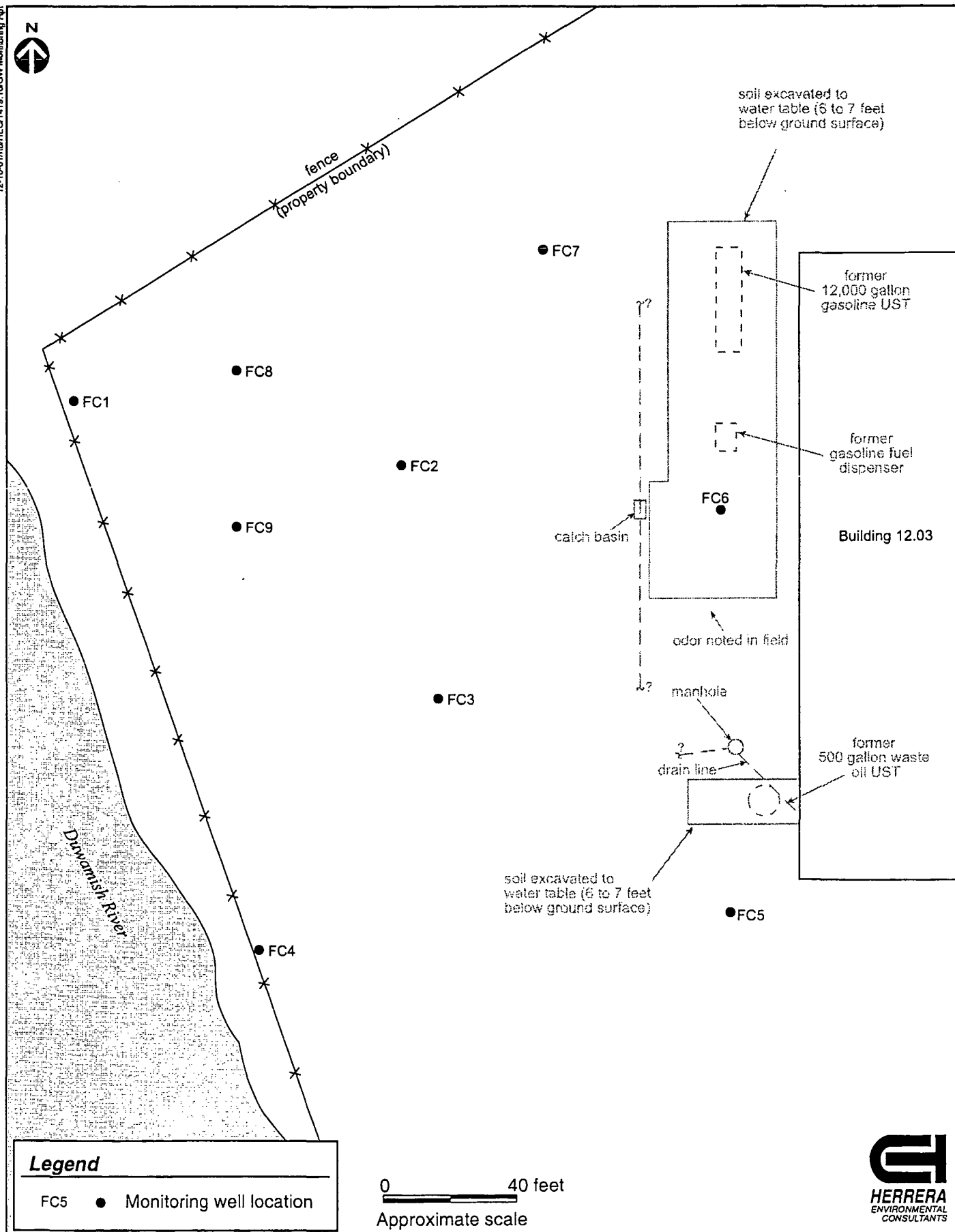


Figure 2. Site layout map, Federal Center South, Seattle, Washington.



**Figure 3. Monitoring well locations adjacent to building 12.03 at Federal Center South, Seattle, Washington.**

## Site Background

The following site characterization and cleanup activities have been conducted at the Federal Center South site since the tanks were removed in May 1998:

Date	Activities performed onsite
5/98	Underground storage tank decommissioning and closure activities, including excavation and removal of one 12,000-gallon gasoline tank, one 1,000-gallon waste-oil tank, and approximately 170 cubic yards contaminated soil.
8/98	Site investigation, including soil and ground water sampling from 15 push probe locations
4/99	Additional soil excavation (approximately 350 yards) from the gasoline dispenser area and from around the waste oil tank.
6/99-7/99	Installation of seven monitoring wells FC1 through FC7 and first quarterly ground water monitoring/sampling event.
10/99	Second quarter ground water monitoring/sampling event.
1/00	Third quarter ground water monitoring/sampling event.
4/00	Fourth quarter ground water monitoring/sampling event.
7/00	Fifth quarter ground water monitoring/sampling event.
10/00	Installation of two additional monitoring wells FC8 and FC9 and sixth quarter ground water monitoring/sampling event.
1/01	Seventh quarter ground water monitoring/sampling event.
4/01	Eighth quarter ground water monitoring/sampling event.

Herrera has provided results from the first four activities listed above in two deliverables entitled *Underground Storage Tank Site Assessment* (dated May 3, 1999) and *Environmental Site Assessment and Ground Water Monitoring* (dated January 7, 2000), —Federal Center South 4735 East Marginal Way, Seattle, Washington.

This project report update presents the results of eight rounds of ground water monitoring and sampling. The first five sampling rounds were conducted at wells FC1 through FC7 from July 1999 to July 2000. Two additional monitoring wells, FC8 and FC9 installed in October 2000, were sampled with wells FC1 through FC7 in October 2000, January, and April 2001.



## Ground Water Monitoring Summary

Field procedures followed during ground water sampling activities are presented in Appendix A. Two additional monitoring wells, FC8 and FC9, were installed in October 2000 to further characterize the extent of ground water contamination. Drilling procedures, including monitoring well installation and decontamination also are presented in Appendix A. Pertinent geologic and hydrogeologic subsurface conditions and photoionization detector (PID) readings were recorded on soil boring logs with well construction details (Appendix B).

### Ground Water Conditions

Ground water surface levels were measured and recorded during eight sampling events conducted on July 6 and October 13, 1999; January 12, April 12, July 20-26, October 26, 2000; and January 24 and April 26, 2001 (Table 1). Figures C-1 through C-8 provided in Appendix C illustrate the ground water surface contours compiled and interpreted from a set of ground water elevation data obtained during each sampling event. The water level contour pattern, as interpreted from the data collected, generally indicates ground water flow to the west, with a flat gradient.

Tidal fluctuations appear to affect ground water flow in the vicinity of well FC1. Water level measurements from FC1 during wide tidal flux periods on October 13, 1999 and January 12, 2000 (see Figures C-2 and C-3) indicate ground water flow direction to the east, contrary to flow across the site in general. Tidal charts from each of the eight days of sample collection are presented in Appendix D (Nautical Software 1995).

A tidal assessment conducted on April 18, 2000 at wells FC1, FC2, FC3, and FC4 during a 12-hour tide cycle demonstrates limited tidal influence across the area of interest. Water level measurements for those wells are presented in Table 2 and illustrated in Figure 4. The Duwamish River level fluctuated 10.3 feet, measured at the intersection of Eighth Avenue South located approximately 1½ miles upriver from the site. Monitoring wells FC1 and FC4, located about 24 feet and 20 feet, respectively, from the Duwamish, were most affected by tidal fluctuations, with net changes of 2.48 feet and 0.21 feet, respectively. Wells FC2 and FC3, located about 115 feet and 100 feet, respectively, from the Duwamish, showed limited tidal effects, with net changes of 0.02 feet and 0.05 feet, respectively. Site ground water flow conditions defined by depth-to-water measurements collected at the time of sampling should not consider data generated at FC1 due to tidal effects.

### Ground Water Analytical Results

Ground water sampling was conducted on July 6 and October 13, 1999; January 12, April 12, July 20, and October 26, 2000; and January 24 and April 26, 2001. All samples collected from

**Table 1. Summary of water level elevation data from monitoring wells at Federal Center South, Seattle, Washington.**

Monitoring Well Identification	Measurement Date	Reference Point Elevation <sup>a</sup> (feet)	Depth to Water <sup>b</sup> (feet)	Water Level Elevation <sup>c</sup> (feet)
FC1	7/6/99	99.23	5.11	94.12
	10/13/99	99.23	4.20	95.03
	1/12/00	99.23	2.55	96.68
	4/19/00	99.23	5.62	93.61
	7/20/00	99.23	5.30	93.93
	10/26/00	99.23	5.40	93.83
	1/24/01	99.23	5.32	93.91
	4/26/01	99.23	5.44	93.79
FC2	7/6/99	100.59	5.90	94.69
	10/13/99	100.59	6.36	94.23
	1/12/00	100.59	5.45	95.14
	4/19/00	100.59	5.77	94.82
	7/20/00	100.59	6.03	94.56
	10/26/00	100.59	6.25	94.34
	1/24/01	100.59	5.84	94.75
	4/26/01	100.59	6.00	94.59
FC3	7/6/99	100.73	6.09	94.64
	10/13/99	100.73	6.56	94.17
	1/12/00	100.73	5.63	95.10
	4/19/00	100.73	5.95	94.78
	7/20/00	100.73	6.26	94.47
	10/26/00	100.73	6.43	94.30
	1/24/01	100.73	5.97	94.76
	4/26/01	100.73	6.20	94.53
FC4	7/6/99	98.65	6.05	92.60
	10/13/99	98.65	6.25	92.40
	1/12/00	98.65	4.76	93.89
	4/19/00	98.65	5.84	92.81
	7/20/00	98.65	5.87	92.78
	10/26/00	98.65	5.84	92.81
	1/24/01	98.65	5.14	93.51
	4/26/01	98.65	5.92	92.73
FC5	7/6/99	100.29	5.48	94.81
	10/13/99	100.29	6.03	94.26
	1/12/00	100.29	4.98	95.31
	4/19/00	100.29	5.34	94.95
	7/20/00	100.29	5.66	94.63
	10/26/00	100.29	5.94	94.35
	1/24/01	100.29	5.43	94.86

**Table 1. Summary of water level elevation data from monitoring wells at Federal Center South, Seattle, Washington (continued).**

Monitoring Well Identification	Measurement Date	Reference Point Elevation <sup>a</sup> (feet)	Depth to Water <sup>b</sup> (feet)	Water Level Elevation <sup>c</sup> (feet)
FC5	4/26/01	100.29	5.50	94.79
FC6	7/6/99	99.76	4.96	94.80
	10/13/99	99.76	5.48	94.28
	1/12/00	99.76	4.49	95.27
	4/19/00	99.76	4.80	94.96
	7/20/00	99.76	5.06	94.70
	10/26/00	99.76	5.36	94.40
	1/24/01	99.76	4.93	94.83
	4/26/01	99.76	5.07	94.69
FC7	7/6/99	100.00	5.18	94.82
	10/13/99	100.00	5.75	94.25
	1/12/00	100.00	4.75	95.25
	4/19/00	100.00	5.07	94.93
	7/20/00	100.00	5.41	94.59
	10/26/00	100.00	5.59	94.41
	1/24/01	100.00	5.18	94.82
	4/26/01	100.00	5.34	94.66
FC8	10/26/00	100.80	5.82	94.98
	1/24/01	100.80	6.13	93.87
	4/26/01	100.80	6.31	94.49
FC9	10/26/00	100.10	6.49	93.61
	1/24/01	100.10	5.37	94.73
	4/26/01	100.10	5.57	94.53

<sup>a</sup> Elevations of reference points (top of well casing) were surveyed relative to a temporary datum with assigned value of 100.00 feet.

<sup>b</sup> Depth to water measurements were taken from reference point marks on top of PVC well casing.

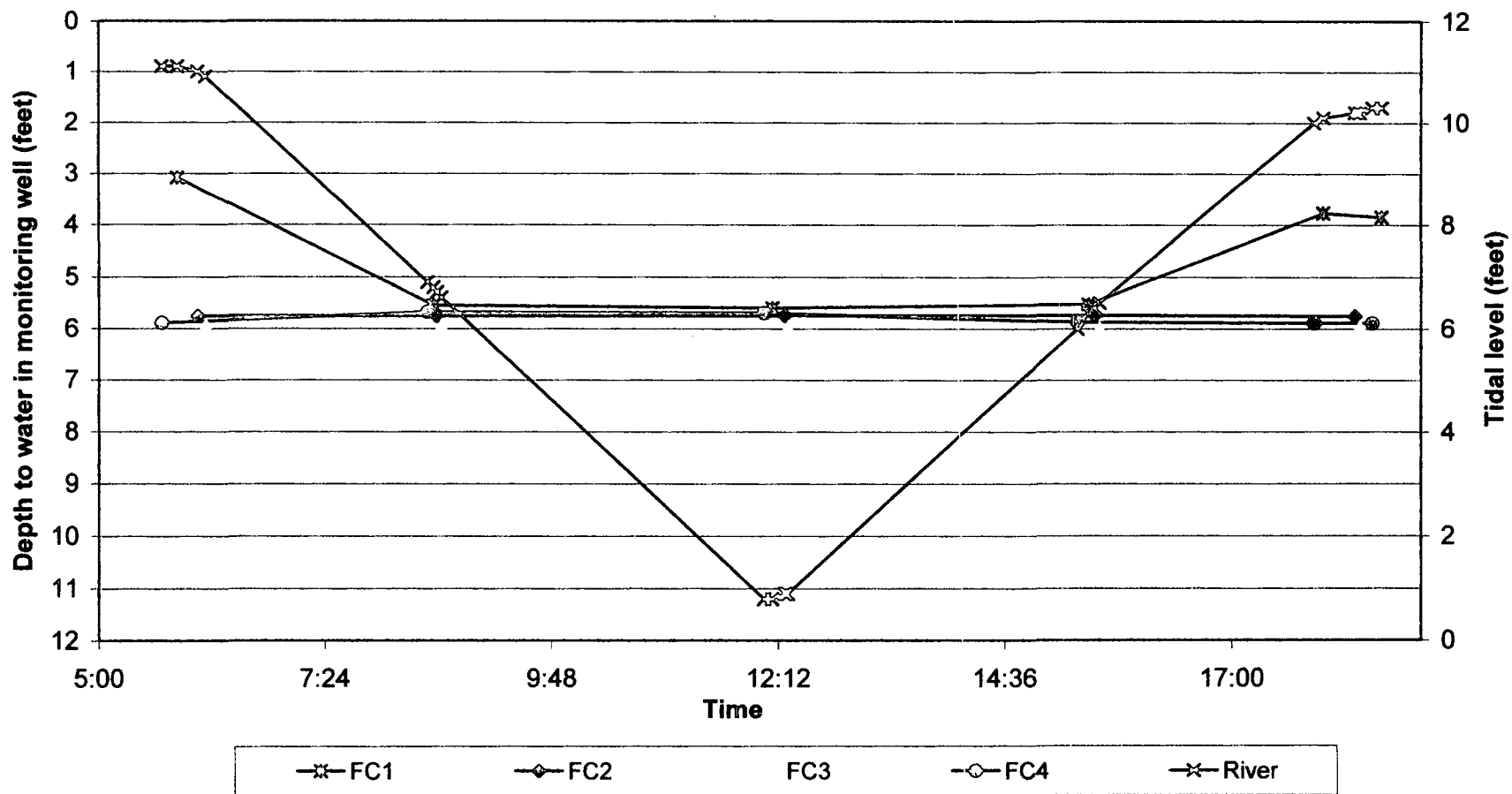
<sup>c</sup> Relative to top of casing reference points.

**Table 2. Comparison of ground water level elevation data from monitoring wells at Federal Center South with Duwamish River tidal cycle, Seattle, Washington, April 18, 2000.**

Monitoring Well Identification	Measurement Time	Tidal Level <sup>a</sup> (feet)	Depth to Water <sup>b</sup> (feet)
FC1	5:50	11.1	3.08
	8:33	6.8	5.55
	12:08	0.8	5.60
	15:29	6.3	5.52
	17:58	10.1	3.77
	18:35	10.3	3.85
FC2	6:03	11.0	5.76
	8:35	6.7	5.76
	12:16	0.9	5.75
	15:33	6.4	5.74
	18:18	10.2	5.76
FC3	6:08	10.9	5.92
	8:38	6.6	5.92
	12:18	0.9	5.95
	15:36	6.5	5.97
	18:21	10.2	5.95
FC4	5:40	11.1	5.89
	8:29	6.9	5.68
	12:03	0.8	5.70
	15:22	6.0	5.87
	17:52	10.0	5.89
	18:29	10.3	5.89

<sup>a</sup> Tidal measurement from Duwamish Waterway, Eighth Avenue South (approximately 1½ miles south from monitoring wells).

<sup>b</sup> Depth to water measurements were taken from reference point marks on top of PVC well casing.



**Figure 4. Ground water levels compared to Duwamish River stage, April 18, 2000 at Federal Center South, Seattle, Washington.**

each sampling event were submitted under chain of-custody protocol to Onsite Environmental, Inc. for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), and gasoline-range petroleum hydrocarbons using the Washington State Department of Ecology (Ecology) NWTPH-Gx/BTEX method. Samples from wells FC3, FC4, FC5, and FC9 also were analyzed for diesel- and heavy oil-range hydrocarbon constituents using the Ecology NWTPH-Dx (extended) method. All of the monitoring wells were analyzed for diesel and heavy oil-range hydrocarbons during one sampling event on January 21, 2001. Analytical results of each sampling event are presented in Table 3. A data quality assurance review for each sampling event is presented in Appendix E and laboratory analytical data including chain-of-custody forms are presented in Appendix F.

Evidence of tidal influence appears to affect water quality, particularly in well FC1. This is based on fluctuating specific conductivity levels observed over the last 2 years in FC1 compared to the consistently lower and more stable levels observed in the remaining six wells. A summary of field parameters measured during each of the sampling events is presented in Table 4, with specific conductance displayed in Figure 5.

Water quality has continued to improve since the tanks and approximately 170 yards of contaminated soil were removed in May 1998, followed by additional excavation and removal of 350 yards of contaminated soil in April 1999. Based on eight quarters of ground water monitoring the following evaluations are provided for each well:

FC1—This well is located downgradient from the former gasoline tank and fuel dispenser at the property boundary and has been sampled during periods of both high and low tides. It consistently has shown no impact from the gasoline release with the exception of very low concentrations of toluene (12 [micrograms per liter]  $\mu\text{g/L}$ ) and total xylenes (1  $\mu\text{g/L}$ ) detected on July 20, 2001. The Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) method A cleanup criteria for toluene is 1,000  $\mu\text{g/L}$  and 1,000  $\mu\text{g/L}$  for xylenes.

FC2—This well is located downgradient from the former gasoline tank and fuel dispenser. During the first four sampling periods elevated concentrations (maximum concentrations listed in parentheses) of gasoline range-hydrocarbons (2,700  $\mu\text{g/L}$ ), benzene (33  $\mu\text{g/L}$ ), ethylbenzene (360  $\mu\text{g/L}$ ), and xylenes (633  $\mu\text{g/L}$ ) have been detected. Concentrations have decreased steadily and during the April 2001 sampling period only benzene (6.3  $\mu\text{g/L}$ ) slightly exceeded the MTCA method A cleanup criteria of 5  $\mu\text{g/L}$  (Figure 6).

**Table 3. Summary of petroleum hydrocarbon and BTEX results of ground water samples collected quarterly on July 6, 1999 through April 26, 2001 from monitoring wells at Federal Center South (µg/L).**

Sample Identification (Sample Date)	Gasoline Range Hydrocarbons	Diesel Range Hydrocarbons	Heavy Oil Range Hydrocarbons	Benzene	Toluene	Ethylbenzene	Xylenes
<i>MTCA method A cleanup level<sup>a</sup></i>	<i>1,000/800<sup>b</sup></i>	<i>500</i>	<i>500</i>	<i>5</i>	<i>1,000</i>	<i>700</i>	<i>1,000</i>
FC1-1 (7/6/99)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-2 (10/13/99)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-3 (1/12/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-4 (4/19/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-5 (7/20/00)	ND (100)	NA	NA	ND (1.0)	12	ND (1.0)	1.0
FC1-6 (10/26/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-7 (1/24/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC1-8 (4/26/01)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC2-1 (7/6/99)	820	NA	NA	5.1	12	91	175
FC2-2 (10/13/99)	2,700	NA	NA	3.8	4.4	360	633
FC2-3 (1/12/00)	1,300	NA	NA	33	1.2	6.5	101
FC2-4 (4/19/00)	1,200	NA	NA	19	ND (1.0)	ND (1.0)	43
FC2-5 (7/20/00)	470	NA	NA	4.2	ND (1.0)	ND (1.0)	13
FC2-6 (10/26/00)	200	NA	NA	3.7	ND (1.0)	ND (1.0)	4.3
FC2-7 (1/24/01)	ND (100)	ND (250)	ND (500)	3.0	ND (1.0)	ND (1.0)	ND (1.0)
FC2-8 (4/26/01)	130	NA	NA	6.3	ND (1.0)	ND (1.0)	2.1
FC3-1 (7/6/99)	ND (100)	ND (250)	ND (500)	3.5	ND (1.0)	ND (1.0)	ND (1.0)
FC3-2 (10/13/99)	ND (100)	ND (250)	ND (500)	3.0	ND (1.0)	ND (1.0)	ND (1.0)
FC3-3 (1/12/00)	ND (100)	390	630	2.9	ND (1.0)	ND (1.0)	ND (1.0)
FC3-4 (4/19/00)	ND (100)	ND (250)	ND (500)	4.5	ND (1.0)	ND (1.0)	ND (1.0)
FC3-5 (7/20/00)	ND (100)	ND (250)	ND (500)	1.3	ND (1.0)	ND (1.0)	ND (1.0)
FC3-6 (10/26/00)	ND (100)	ND (250)	ND (500)	6.1	ND (1.0)	ND (1.0)	ND (1.0)
FC3-7 (1/24/01)	ND (100)	ND (250)	ND (500)	4.0	ND (1.0)	ND (1.0)	ND (1.0)
FC3-8 (4/26/01)	ND (100)	ND (250)	ND (500)	7.7	ND (1.0)	ND (1.0)	ND (1.0)
FC4-1 (7/6/99)	ND (100)	ND (250)	520	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-2 (10/13/99)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-3 (1/12/00)	ND (100)	890	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-4a (4/19/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-4b (4/19/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-5 (7/26/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-6 (10/26/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC4-7 (1/24/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	1.7	ND (1.0)	1.4
FC4-8 (4/26/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-1 (7/6/99)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-2 (10/13/99)	ND (100)	ND (250)	ND (500)	1.0	ND (1.0)	ND (1.0)	ND (1.0)
FC5-3 (1/12/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-4 (4/19/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-5 (7/20/00)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)

**Table 3. Summary of petroleum hydrocarbons and BTEX results of ground water samples collected quarterly on July 6, 1999 through April 26, 2001 from monitoring wells at Federal Center South (µg/L) (continued).**

Sample Identification (Sample Date)	Gasoline Range Hydrocarbons	Diesel Range Hydrocarbons	Heavy Oil Range Hydrocarbons	Benzene	Toluene	Ethylbenzene	Xylenes
FC5-6 (10/26/00)	ND (100)	250	<b>560</b>	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-7 (1/24/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC5-8 (4/26/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC6-1 (7/6/99)	500	NA	NA	ND (1.0)	ND (1.0)	19	9.4
FC6-2 (10/13/99)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC6-3 (1/12/00)	230	NA	NA	ND (1.0)	ND (1.0)	3.4	ND (1.0)
FC6-4 (4/19/00)	240	NA	NA	ND (1.0)	ND (1.0)	2.4	ND (1.0)
FC6-5 (7/20/00)	160	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC6-6 (10/26/00)	140	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC6-7 (1/24/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC6-7 (1/24/01)	110	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-1 (7/6/99)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-2 (10/13/99)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-3 (1/12/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-4 (4/19/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-5 (7/20/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-6 (10/26/00)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-7 (1/24/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC7-8 (4/26/01)	ND (100)	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC8-6 (10/26/00)	140	NA	NA	<b>8.5</b>	(1.0)	(1.0)	5.2
FC8-7 (1/24/01)	ND (100)	ND (250)	ND (500)	1.8	(1.0)	(1.0)	3.9
FC8-8 (4/26/01)	ND (100)	NA	NA	2.3	(1.0)	(1.0)	3.1
FC9-6 (10/26/00)	ND (100)	<b>700</b>	<b>3,300</b>	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC9-7 (1/24/01)	ND (100)	ND (250)	<b>700</b>	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
FC9-8 (4/26/01)	ND (100)	ND (250)	ND (500)	ND (1.0)	ND (1.0)	ND (1.0)	1.3

<sup>a</sup> MTCA—Model Toxics Control Act cleanup regulation (Ecology 2001).

<sup>b</sup> Higher concentration 1,000 µg/L applies if no benzene is present in ground water.

Concentrations exceeding MTCA method A cleanup levels are shown in **boldface** type.

(1.0) Indicates constituent not found above the enclosed practical quantitation limit.

NA Not analyzed



**Table 4. Summary of field parameters measured during quarterly ground water sampling from July 6, 1999 through April 26, 2001, Federal Center South, Seattle, Washington.**

Sample Identification	Date Collected	pH	Specific Conductance (µmhos/cm)	Temperature °C
FC1-1	7/6/99	6.40	7,350	18.1
FC1-2	10/13/99	7.44	1,675	13.9
FC1-3	1/12/00	6.72	7,630	5.6
FC1-4	4/19/00	6.34	1,858	13.1
FC1-5	7/20/00	6.49	5,710	18.0
FC1-6	10/26/00	6.33	8,620	13.7
FC1-7	1/24/01	6.36	6,570	10.8
FC1-8	4/26/01	6.22	2,460	12.8
FC2-1	7/6/99	6.41	1,703	18.5
FC2-2	10/13/99	6.30	2,210	18.4
FC2-3	1/12/00	6.06	947	11.8
FC2-4	4/19/00	6.53	815	13.2
FC2-5	7/20/00	6.67	831	18.7
FC2-6	10/26/00	6.55	1,001	17.0
FC2-7	1/24/01	6.64	796	12.1
FC2-8	4/26/01	6.37	866	13.6
FC3-1	7/6/99	6.85	3,460	17.8
FC3-2	10/13/99	6.97	2,410	17.2
FC3-3	1/12/00	6.53	1,867	12.3
FC3-4	4/19/00	6.78	1,764	13.1
FC3-5	7/20/00	6.84	1,211	17.2
FC3-6	10/26/00	6.82	1,838	17.4
FC3-7	1/24/01	6.91	1,536	12.8
FC3-8	4/26/01	6.38	1,208	13.6
FC4-1	7/6/99	6.84	1,550	16.9
FC4-2	10/13/99	6.70	1,513	16.8
FC4-3	1/12/00	6.29	415	9.4
FC4-4	4/19/00	6.97	1,038	11.5
FC4-5	7/20/00	6.58	1,211	15.3
FC4-6	10/26/00	6.64	996	16.5
FC4-7	1/24/01	6.81	1,411	9.9
FC4-8	4/26/01	6.36	1,061	13.3
FC5-1	7/6/99	6.45	1,179	18.8
FC5-2	10/13/99	6.47	813	19.7
FC5-3	1/12/00	6.06	715	12.3
FC5-4	4/19/00	6.42	662	12.5
FC5-5	7/20/00	6.47	811	19.0
FC5-6	10/26/00	6.47	742	18.0
FC5-7	1/24/01	6.41	708	12.6
FC5-8	4/26/01	6.16	786	13.5

**Table 4. Summary of field parameters measured during quarterly ground water sampling from July 6, 1999 through April 26, 2001 Federal Center South, Seattle, Washington (continued).**

Sample Identification	Date Collected	pH	Specific Conductance (µmhos/cm)	Temperature °C
FC6-1	7/6/99	6.41	2,380	20.1
FC6-2	10/13/99	6.62	1,452	19.6
FC6-3	1/12/00	6.16	847	11.9
FC6-4	4/19/00	6.64	1,146	14.1
FC6-5	7/20/00	6.30	656	22.0
FC6-6	10/26/00	6.56	926	17.8
FC6-7	1/24/01	6.63	1,620	12.9
FC6-8	4/26/01	6.29	1,245	14.7
FC7-1	7/6/99	6.32	839	18.5
FC7-2	10/13/99	6.33	680	18.8
FC7-3	1/12/00	6.06	422	11.7
FC7-4	4/19/00	6.12	587	13.6
FC7-5	7/20/00	6.27	610	19.5
FC7-6	10/26/00	6.28	522	18.2
FC7-7	1/24/01	6.24	587	13.1
FC7-8	4/26/01	6.01	510	14.2
FC8-6	10/26/00	6.36	1,025	17.1
FC8-7	1/24/01	6.46	905	13.2
FC8-8	4/26/01	6.30	709	13.9
FC9-6	10/26/00	6.44	2,010	17.4
FC9-7	1/24/01	6.61	1,186	12.8
FC9-8	4/26/01	6.20	1,184	14.1

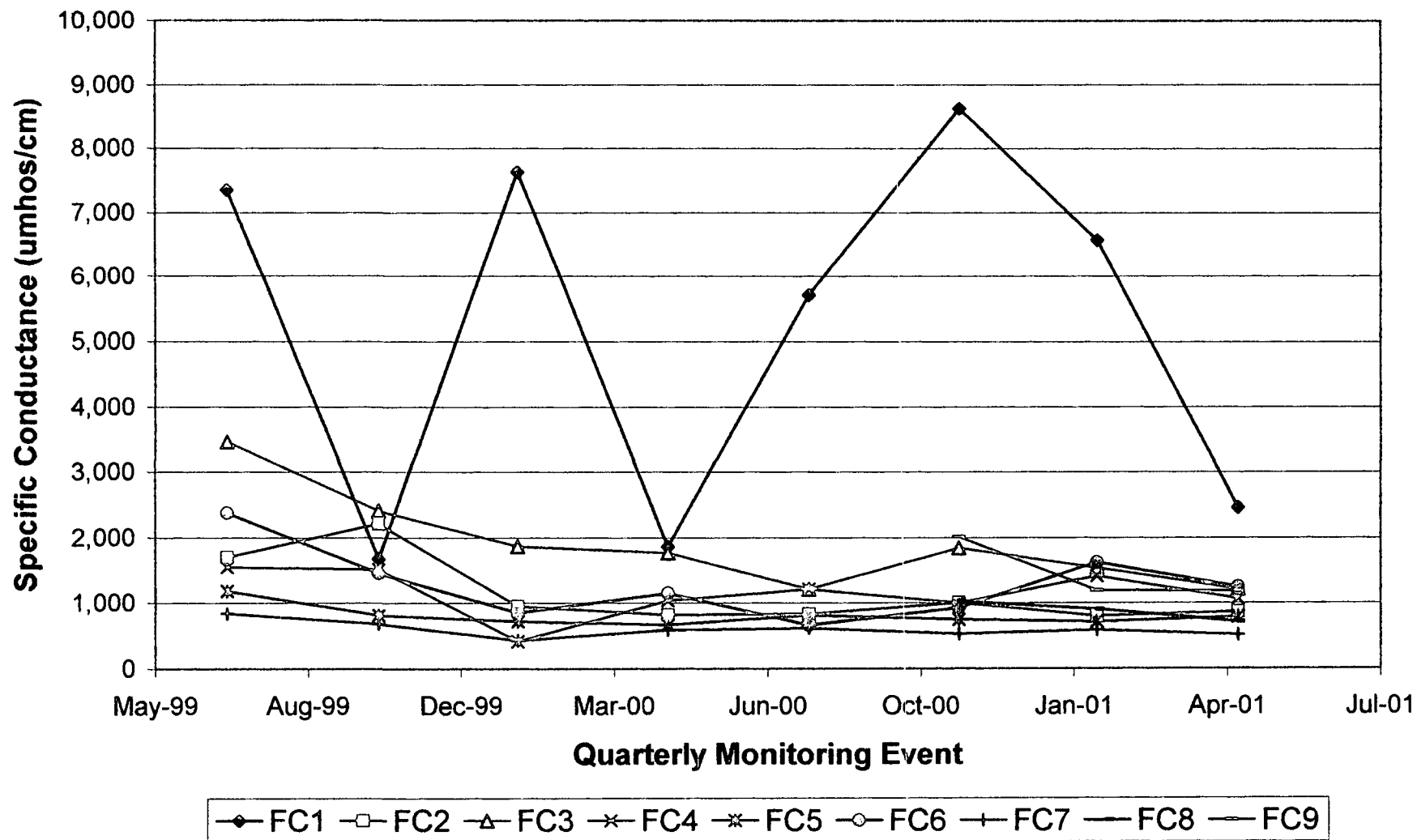


Figure 5. Specific conductance measured in ground water monitoring wells at Federal Center South, Seattle, Washington.



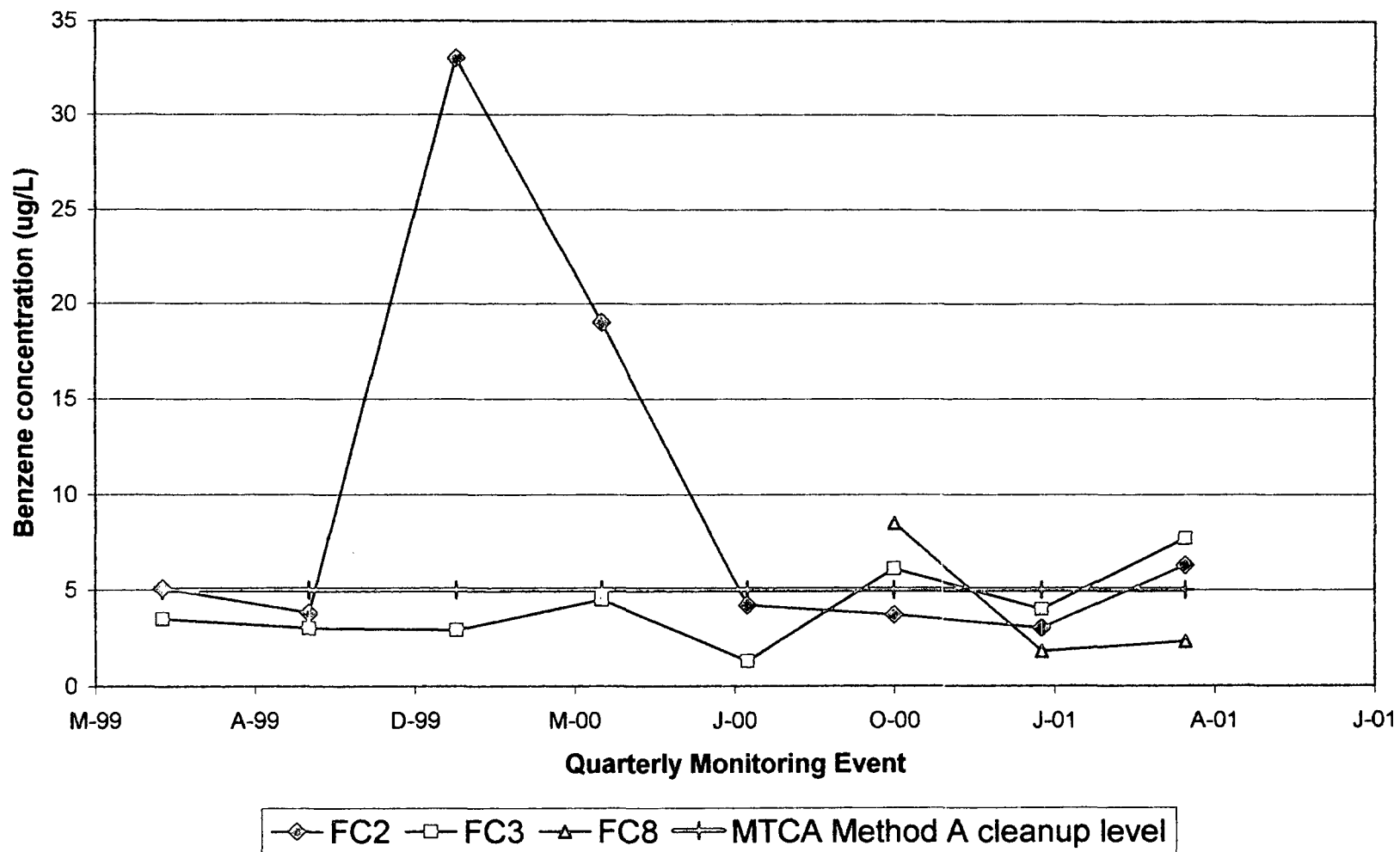


Figure 6. Trend analysis of benzene concentrations in ground water at Federal Center South, Seattle, Washington.



FC3—This well is located downgradient of the former gasoline fuel dispenser. Benzene concentrations have been detected during all eight sampling events with concentrations ranging from 1.3 to 7.7 µg/L (Figure 6). Benzene concentrations slightly exceeded MTCA method A cleanup criteria of 5 µg/L during the October 2000 and April 2001 sampling events, with concentrations of 6.1 and 7.7 respectively. Diesel range- (390 µg/L) and heavy oil range- (630 µg/L) hydrocarbons were the only other parameters detected during one (January 2000) of eight sampling events. The MTCA method A cleanup criterion is 500 µg/L for diesel and heavy oil-range petroleum hydrocarbons.

FC4—This well is located at the property boundary, downgradient of the former gasoline fuel dispenser. During the April 2000 sampling event it was sampled at high and low tidal cycles and sample results were below practical quantitation limits. No gasoline- and/or diesel- and heavy oil-range hydrocarbons or BTEX constituents were detected during six of nine sampling events. Heavy oil (520 µg/L) and diesel range-hydrocarbons (890 µg/L), were detected once in January 1999 and January 2000 respectively, above the MTCA method A cleanup level of 500 mg/L.

FC5—This well is located downgradient of the former diesel fuel tank. Low concentrations of and diesel range-hydrocarbons (250 µg/L) and benzene (1.0 µg/L) were detected once (October 13, 1999) at concentrations equal to practical quantitation limits, but never above the MTCA method A cleanup levels. Heavy oil-range hydrocarbons (560 µg/L) were detected once (October 26, 2001) slightly above the MTCA criteria of 500 µg/L.

FC6—This well is located cross-gradient of fuel dispenser for the former gasoline tank. Concentrations of gasoline range-hydrocarbons, ethylbenzene, and toluene have steadily declined since the first sampling event. None of these concentrations have ever exceeded the MTCA method A cleanup criteria.

FC7—This well is located downgradient of the former gasoline tank. No gasoline-range hydrocarbons or BTEX constituents were detected above the practical quantitation limits during the eight quarterly sampling events.

FC8—This well is located downgradient of the former gasoline tank and fuel dispenser. Benzene (8.5 µg/L) exceeded the MTCA method A cleanup criterion (5 µg/L) when initially sampled in November 2000 and has decreased to 2.3 µg/L in April 2001 (Figure 6). Xylenes and gasoline range-hydrocarbons were the only other parameters detected, but at concentrations below the MTCA cleanup criteria.

FC9—This well is located downgradient of the former gasoline fuel dispenser. Heavy oil range-hydrocarbons (3,300 µg/L) were detected above the MTCA method A cleanup criterion (500 µg/L) during initial sampling in November 2000, and then decreased below the practical quantitation limit (500 µg/L) by April 2001. Xylene was the only other constituent detected in April 2001, but at a concentration less than the MTCA cleanup criterion.

## Conclusions/Recommendations

An assessment of conditions at the Federal Center South site over the last 2 years following removal of one gasoline and one waste oil tank and adjacent contaminated soil indicates the following:

- Soil removal and natural attenuation have resulted in improved ground water quality downgradient of the former gasoline and diesel fuel underground storage tanks.
- Benzene detected in monitoring wells FC-2 (6.3 µg/L) and FC-3 (7.7 µg/L) was the only monitored constituent that continues to exceed MTCA method A cleanup criteria (5 µg/L) as of the last monitoring event on April 26, 2001.
- All nine monitoring wells should continue to be monitored on a quarterly basis for one more year, with the exception of well FC-7. No gasoline-, diesel-, heavy oil-range hydrocarbons, or BTEX constituents have ever been detected above practical quantitation limits during eight sampling events at well FC-7. This well will be sampled only during the fourth quarter monitoring period scheduled for April 2002.

## References

- Ecology. 2001. The Model Toxics Control Act, Cleanup Regulation, Washington Administrative Code, Chapter 173-340. Toxics Cleanup Program. Publication No. 94-06. Washington State Department of Ecology.
- Herrera. 1999. Underground Storage Tank Site Assessment for Federal Center South, Seattle, Washington. Prepared for U.S. General Services Administration by Herrera Environmental Consultants, Inc., Seattle, Washington, May 3, 1999.
- Herrera. 2000. Environmental Site Assessment and Ground Water Monitoring for Federal Center South, Seattle, Washington. Prepared for U.S. General Services Administration by Herrera Environmental Consultants, Inc., Seattle, Washington, January 7, 2000.
- Nautical Software. 1995. Tides and Currents for Windows by Nautical Software, Inc. 1994-1995.
- USGS. 1983. Seattle South, Washington. Topographic-bathymetric 7.5 by 15-minute quadrangle map (N4730-W12215/7.5x15). U.S. Geological Survey, Denver, Colorado



## APPENDIX A

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### Field Procedures

## Field Procedures

This appendix documents the procedures used to perform the field investigations described in this report. The discussion includes information on the following subjects:

- Monitoring well installation
- Ground water sampling procedures at monitoring wells
- Sample jars, sample handling, and chain-of-custody procedures
- Investigation-derived waste disposal.

These procedures are presented in the following sections.

### Sample Designation

Ground water monitoring samples were designated by a four-digit alphanumeric system referencing the general site location and a number denoting the sampling event from which the samples were collected. For example:

- FC4-1 denotes the ground water sample collected at Federal Center South monitoring well location 4, collected during sampling event 1 on July 6, 1999.

### Sampling Procedures

#### Soil Sampling from Auger Drilled Soil Borings

Two monitoring wells, FC8 and FC9, were installed on October 24, 2000 using the hollow-stem auger drilling method. Borings were completed using an auger drill rig equipped with 4.25-inch inside diameter hollow-stem auger flights. Discrete soil samples for soil classification were collected at 5-foot intervals using a drive split-spoon sampler 18 inches long by 2-inch outside diameter. The sampler was driven using a 140-pound downhole jaw hammer with a drop of 30 inches. Following retrieval, each sample was logged by a geologist for soil lithologies, field screened for indications of contamination using a photoionization detector (PID), and observed for moisture content for indications of ground water. Soil encountered during drilling was visually classified in accordance with the Unified Soil Classification System (ASTM D2488-90). Pertinent geologic and hydrogeologic subsurface conditions and PID readings were recorded on soil boring logs (Appendix B).

### **Monitoring Well Installation**

Monitoring wells were constructed of 2-inch inside diameter Schedule 40 polyvinyl chloride (PVC) blank casing flush threaded to 0.010-inch slot machine cut PVC well screen casing. All wells were sealed with flush threaded PVC bottom caps and secured at the top with a locking expansion plug-type cap and padlock.

Wells FC8 and FC9 were installed to respective depths of 16.5 and 14 feet. Location of the screened interval was determined in the field based on indication of water level observed during drilling. A filter pack of clean #2/12-graded silica sand was placed in the annular space between the casing and borehole to a height approximately 2 feet above the top of the slotted well casing. Bentonite chips were placed above the filter pack to within 2 feet of the ground surface. The remaining portion of each boring was filled with concrete to a point just below the top of the well casing. The well was completed with a traffic-rated monument that extends slightly above the ground surface so that surface water run-off will be routed away from the well head. The monument was installed and finished at the surface with concrete. Well construction details are provided on boring logs in Appendix B.

### **Well Development**

Following installation, monitoring wells were developed through a combination of surging and pumping. Development continued until levels of sand and silt were reduced and water removed from the well was generally of clear quality. Development water from each well was contained in 55-gallon drums and stored temporarily at the site.

### **Ground Water Sampling from Monitoring Wells**

General procedures for collecting ground water samples from wells were as follows:

1. The well monument cover was removed and the condition of the well and surrounding area was observed. Observations were noted in the field notebook and well sampling log. The well casing plug was unlocked and removed.
2. Using an electronic water level meter, the depth to ground water was measured to the nearest 0.01 feet. Measurements were recorded relative to the surveyed reference mark at the top of the PVC well casing. Date, time, and measurements were recorded in the field notebook and well sampling log.
3. The well was purged of standing water using a dedicated disposable high-density polyethylene bailer attached to clean nylon twine that was lowered into the well to the screened interval. During purging, pH, water temperature, and specific conductivity were measured. The amount of

water purged, field measurements, and time of collection were recorded in the field notebook and well sampling log. The well was purged until field readings had stabilized, with a minimum of three casing volumes of standing water removed prior to sampling. Purged water removed during development was contained in 55-gallon drums, temporarily stored onsite along the fence near well FC1.

4. Following purging, samples were collected using the same dedicated disposable bailer used to purge the well. Samples were collected by gently lowering the bailer into the well, retrieving the bailer to the surface, and pouring the contents of the bailer directly into sample containers provided by the analytical laboratory. Care was taken to ensure that no bubbles or headspace were present. Containers were securely capped, labeled, and placed into a chilled cooler for storage prior to delivery to the laboratory. The date and time of each sample collected was recorded in the field notebook, well sampling log, and on the chain-of-custody form.
5. The well casing plug was replaced and locked, and the well monument cover was secured.

### **Survey Locations and Elevations**

A scaled site map was drawn, including locations of all wells and other site features, based on a site map provided by U.S. GSA. Well locations and other site features were located by measuring distances from reference points using a measuring tape. Distance measurements for the well locations and site features were plotted on the site base map.

Survey elevations of the reference mark on top of each well casing were collected following well installation using an auto leveler, tripod, and a level rod with graduations in feet and decimals. Wellhead elevations were measured and calculated to the nearest 0.01 foot and recorded in the field notebook. The wellhead reference mark at well location FC7 was used as a temporary benchmark with assigned elevation of 100.00 feet.

### **Sample Handling**

All samples collected during this investigation were handled according to the procedures described in the following sections.

### **Sample Containers and Labeling**

Samples were placed in containers supplied by the analytical laboratory appropriate for the analyses to be performed. Sample container labels were completed at the time of collection using a permanent waterproof pen or marker. Sample labels included the following information:

- Project name
- Sample identification (including site designation, sample number, and depth interval collected)
- Date and time of collection
- Initials of sampling personnel
- General analysis to be performed.

### **Sample Storage**

Immediately following sample collection, sample containers were placed into a chilled cooler for storage prior to delivery to the analytical laboratory. Care was taken to ensure that sample holding times were not exceeded during periods of storage.

### **Chain of Custody**

Following collection, sample information was recorded on a chain-of-custody form. The purpose of this record is to account for the possession (or custody) of each sample from the time it is collected until laboratory testing and reporting is complete. The signature of each person in possession of the samples must be recorded on the chain-of-custody form. Information recorded on the chain-of-custody record included the following:

- Project name and location
- Project number
- Names of project manager and sampling personnel
- Sample identification
- Sample matrix
- Date and time of collection (for each sample)
- Analysis requested (for each sample)
- Number of sample containers (for each sample)
- Signature, date, and time (for each person releasing or accepting sample custody).

### **Sample Shipment and Delivery**

Samples collected during this investigation were hand-delivered to the analytical laboratory.

### **Sample Documentation**

All sampling activities during this investigation were documented in a dedicated field notebook. The notebook was labeled with the project name, project identification number, dates of field activities, and name of the field coordinator. All relevant activities were recorded in the field notebook during the period of the field investigation. Entries into the field notebook were made in permanent ink. Corrections were made by placing a single line through the original entry accompanied by the initials of the person entering the correction. At a minimum, information in the field notebook included:

- Date and atmospheric conditions
- Major activities to be performed
- Names of sampling personnel present (including subcontractors)
- Time of arrival at site, set-up, sample collection, and completion at each sample station
- General condition of sampling area
- Any unusual events or occurrences.

### **Disposal of Investigation-Derived Waste**

All wastes generated during this investigation were disposed of according to regulatory requirements.

### **Disposal of Incidental Trash**

Incidental trash generated during this investigation (including discarded gloves, paper towels, disposable bailers, and food packaging) was placed in plastic trash bags and disposed of as solid waste into a dumpster adjacent to Building 12.03 at Federal Center South in Seattle, Washington.

### **Decontamination Fluids and Purge Water Disposal**

Decontamination fluids and purge water generated during sampling activities were secured in 55-gallon drums and temporarily stored adjacent to the fence along the western property boundary near monitoring well FC1. Based on approval from King County Industrial Waste division, the water was discharged into a sink located inside Building 12.01.

### **Disposal of Soil Cuttings**

Soil cuttings generated during drilling of soil borings for monitoring wells FC-8 and FC-9 were contained in 55-gallon drums and stored temporarily onsite adjacent to the fence along the western property boundary near monitoring well FC-1. Arrangements were made with TPS Technologies for transport and treatment at their approved facility in Tacoma, Washington. A copy of the soil recycling certificate is included on the next page.

# Soil Recycling Certificate

**TPS Technologies Inc.** does hereby certify

that 2.00 tons of non-hazardous contaminated soil  
received from

**Federal Center South  
Herrera Environmental (Consultant)  
4735 E. Marginal Way South  
Seattle, WA**

Under Manifest / authorization number 03-03205  
5202

have been properly recycled to approved regulatory standards  
at our Soil Recycling Facility in Lakewood, WA



Dated this 10th April 2001

Sworn and Attested by:  
**TPS Technologies Inc.**

By:

A handwritten signature in black ink, appearing to be 'B. H. H. H.', written over a horizontal line.

## APPENDIX B

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# Boring Logs and Well Construction Details





# SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring # FC8  
Total depth: 16.5'  
Sheet 1 of 2

Project name: FCMON2  
Project number: C00-00491-055  
Client: GSA  
Location: Between FC1 and FC2  
HEC rep.: Bruce Carpenter  
Start Date: 10/24/00  
Compl. Date: 10/24/00

Drilling Contractor: Cacade  
Drilling method: HSA  
Sampling method: Split spoon  
Measuring point elev.: NA  
Ground elevation: NA  
Air monitoring (y/n): Yes  
Instrument(s): PID Microtip 2020

Casing material: Sch 40 PVC  
Casing diameter: 2-inch  
Screen slot width: 0.010-inch  
Casing joint type: Flush treaded  
Filter pack: Monterey #2/12 silica sand  
Annular seal: Bentonite chips  
Monument type: Flush-mounted

Depth to water	6.5 ft.	6.49 ft.	
Reference point	Ground surface	Top of casing	
Time	8:45	08:37	
Date	10/24/00	10/26/00	

## Monitoring well details

	Cement		Filterpack
	Bentonite		Well screen

Instrument reading	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Soil group	Soil description	Well details
						Asphalt/gravel	
0	SS	100	20	1	SP	Brown medium SAND, dry	
			20	2			
			20	3			
			29	4	ML	Dark brown sandy SILT with gravel, dry	
				5		Black medium SAND, dry	
0	SS	100	20	6	▽	Water encountered during drilling at 6.5'	
			20	7			
0	SS	100	17	8	SP	Black medium SAND, wet	
			13	9			
			8	10			
0	SS	100	7	11		Brown sandy SILT with organic material	
			6	12			
			7	13	ML	Gray SILT with clay, organic material	
0	SS	100	5	14			
			7	15			
			6				



# SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring # FC8

Total depth: 16.5'

Sheet 2 of 2

Project name: FCMON2

Project number: C00-00491-055

Client: GSA

Location: Between FC1 and FC2

HEC rep.: Bruce Carpenter

Start Date: 10/24/00

Compl. Date: 10/24/00

Drilling Contractor: Cacade

Drilling method: HSA

Sampling method: Split spoon

Measuring point elev.: NA

Ground elevation: NA

Air monitoring (y/n): Yes

Instrument(s): PID Microtip 2020

Casing material: Sch 40 PVC

Casing diameter: 2-inch

Screen slot width: 0.010-inch

Casing joint type: Flush treaded

Filter pack: Monterey #2/12 silica sand

Annular seal: Bentonite chips

Monument type: Flush-mounted

Depth to water	6.5 ft.	6.49 ft.	
Reference point	Ground surface	Top of casing	
Time	8:45	08:37	
Date	10/24/00	10/26/00	

## Monitoring well details



Cement



Filterpack



Bentonite



Well screen

Instrument reading	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Soil group	Soil description	Well details
0	SS	100	4 5 7	16 17		Boring drilled to 16.5 feet , monitoring well installed	



# SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring # FC9  
Total depth: 14'  
Sheet 1 of 1

Project name: FCMON2  
Project number: C00-00491-055  
Client: GSA  
Location: West of FC2  
HEC rep.: Bruce Carpenter  
Start Date: 10/24/00  
Compl. Date: 10/24/00

Drilling Contractor: Cacade  
Drilling method: HSA  
Sampling method: Split spoon  
Measuring point elev.: NA  
Ground elevation: NA  
Air monitoring (y/n): Yes  
Instrument(s): PID Microtip 2020

Casing material: Sch 40 PVC  
Casing diameter: 2-inch  
Screen slot width: 0.010-inch  
Casing joint type: Flush treaded  
Filter pack: Monterey #2/12 silica sand  
Annular seal: Bentonite chips  
Monument type: Flush-mounted

Depth to water	5.82 ft.		
Reference point	TOC		
Time	8:41		
Date	10/26/00		

## Monitoring well details

	Cement		Filterpack
	Bentonite		Well screen

Instrument reading	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Soil group	Soil description	Well details
0	SS	100	20	1	SW	Asphalt/gravel	
				2		Brown SAND, dry	
				3			
0	SS	100	27	4			
			32	5			
			37	6	∇ ML	Black sandy, SILT	
0	SS	100	6	7			
			10	8	SW	Black SAND with organic material	
			11	9			
0	SS	100	5	10	ML	Brown sandy SILT with organic material	
			5	11			
			6	12			
0	SS	100	5	13		Gray clayey SILT with organic material	
			4	14			
			4	15		Boring drilled to 14 feet , monitoring well installed	

## APPENDIX C

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### Water Level Contour Maps

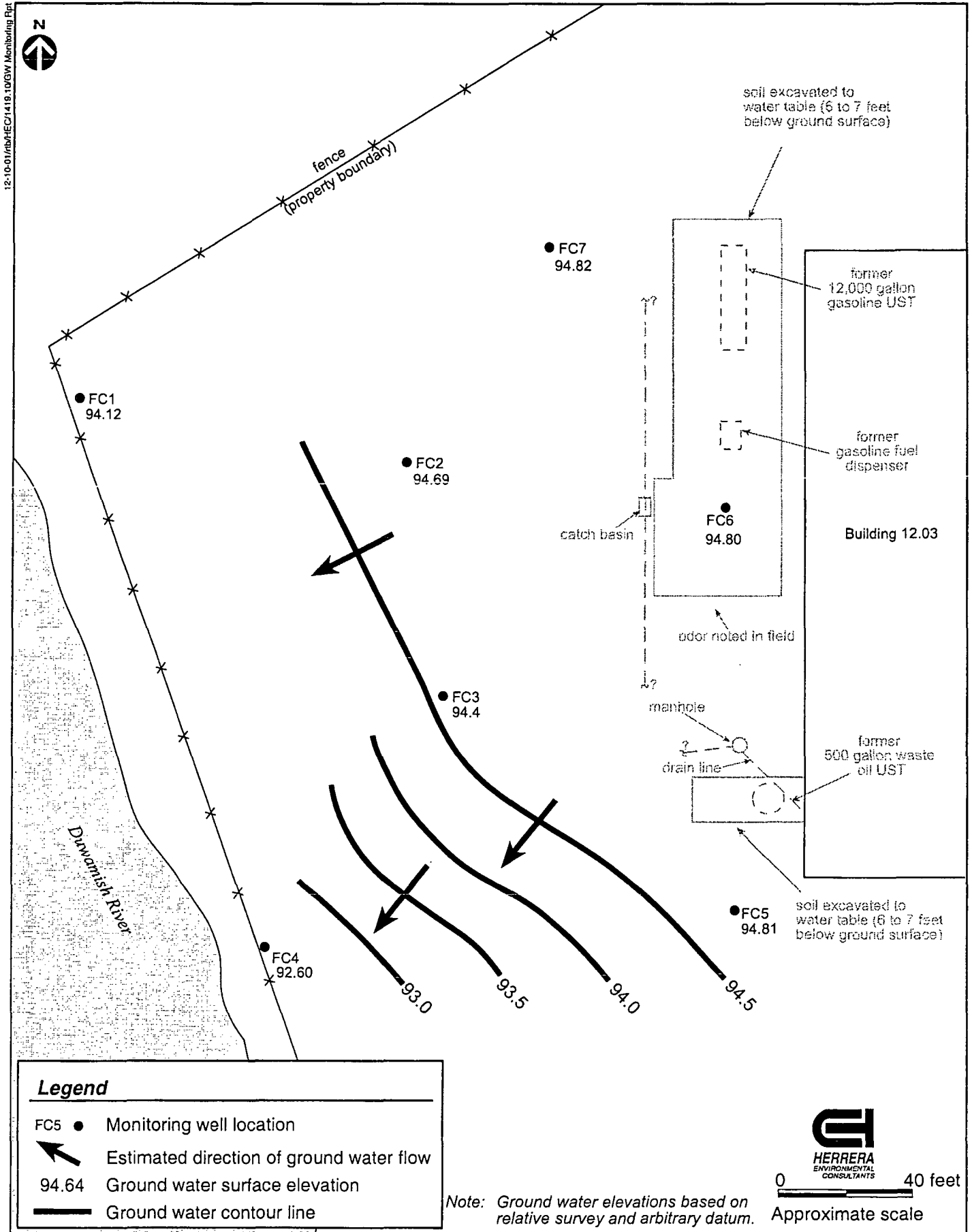


Figure C-1. Water level contour map, July 6, 1999, Federal Center South, Seattle, Washington.

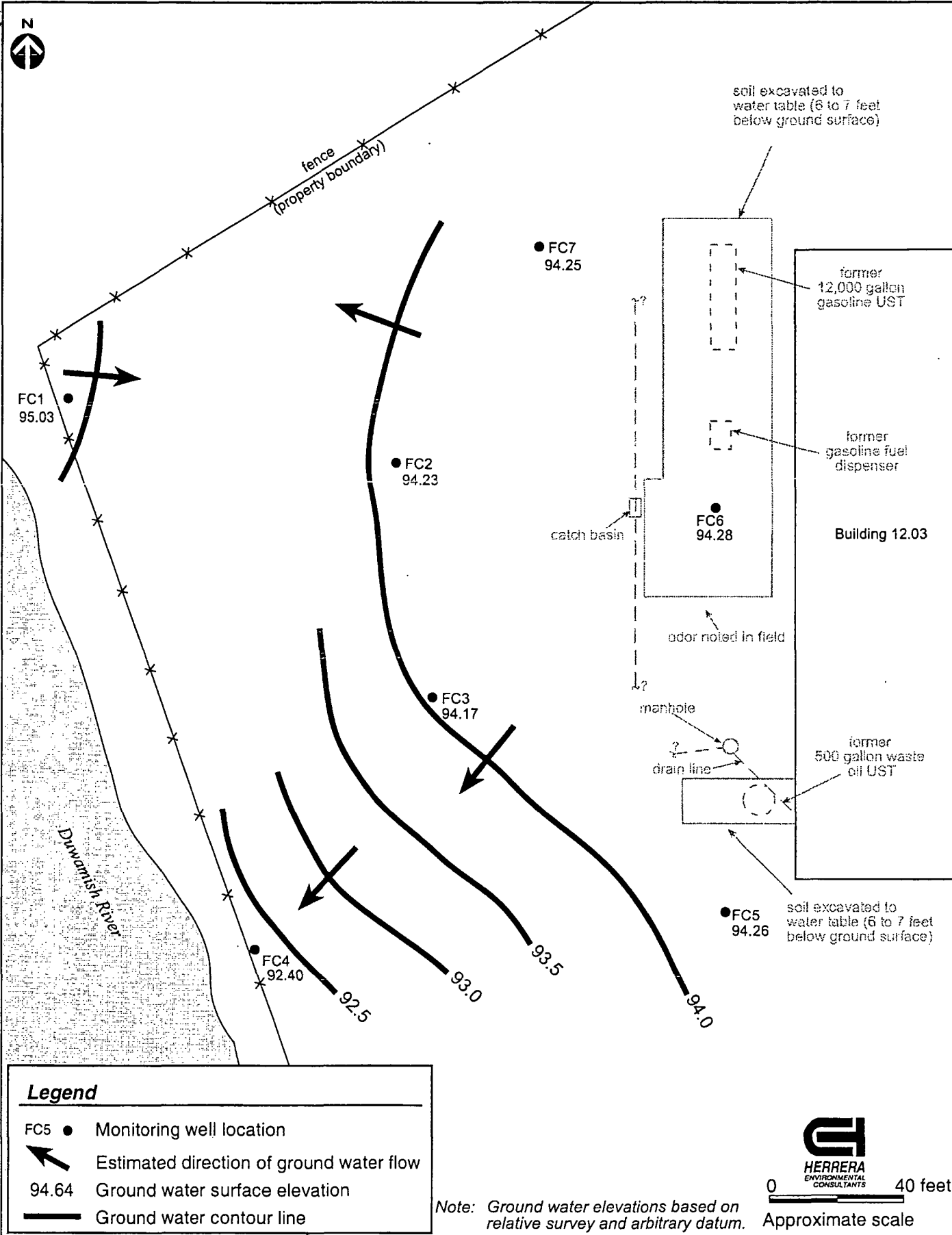


Figure C-2. Water level contour map, October 13, 1999, Federal Center South, Seattle, Washington.

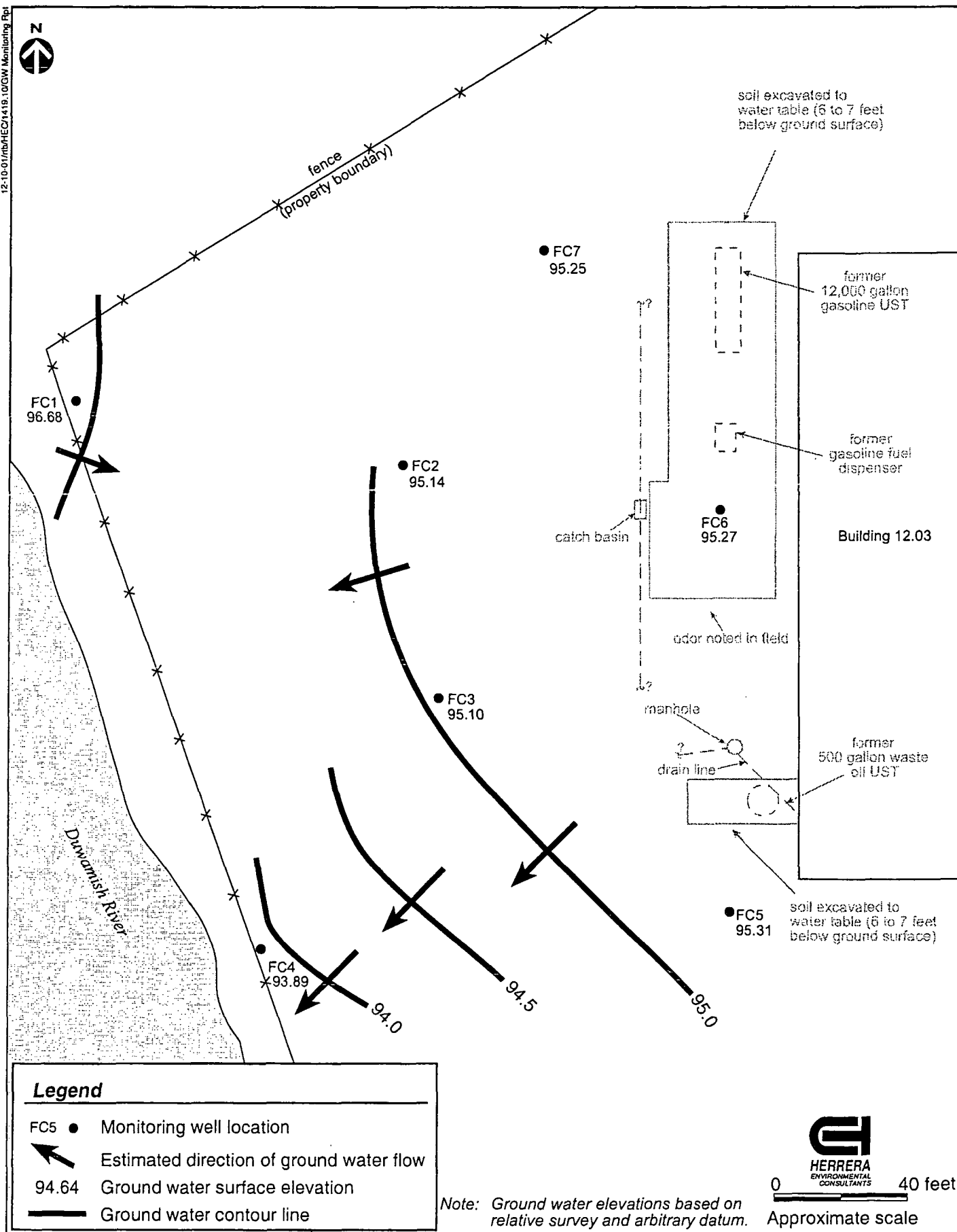


Figure C-3. Water level contour map, January 12, 2000, Federal Center South, Seattle, Washington.

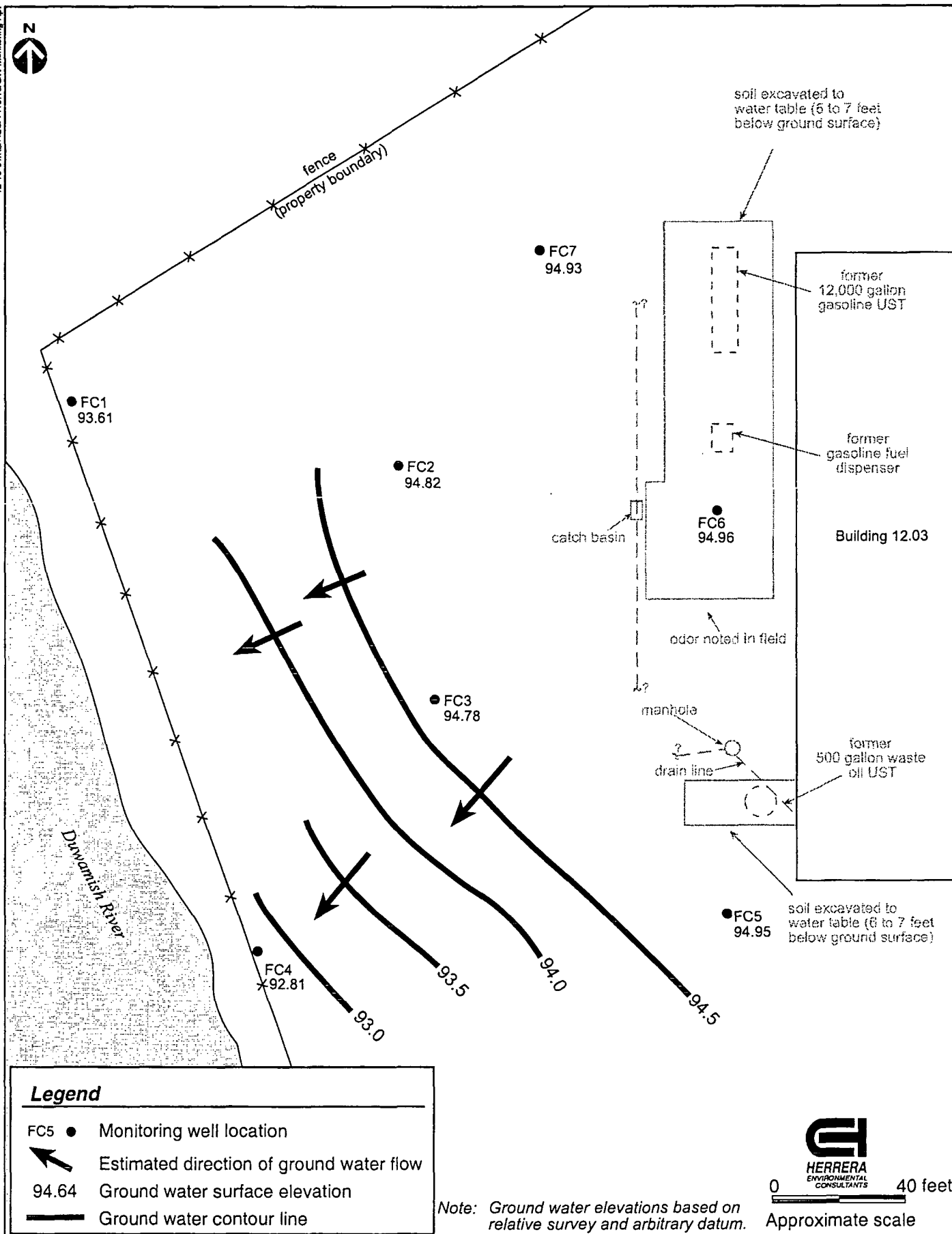


Figure C-4. Water level contour map, April 19, 2000, Federal Center South, Seattle, Washington.



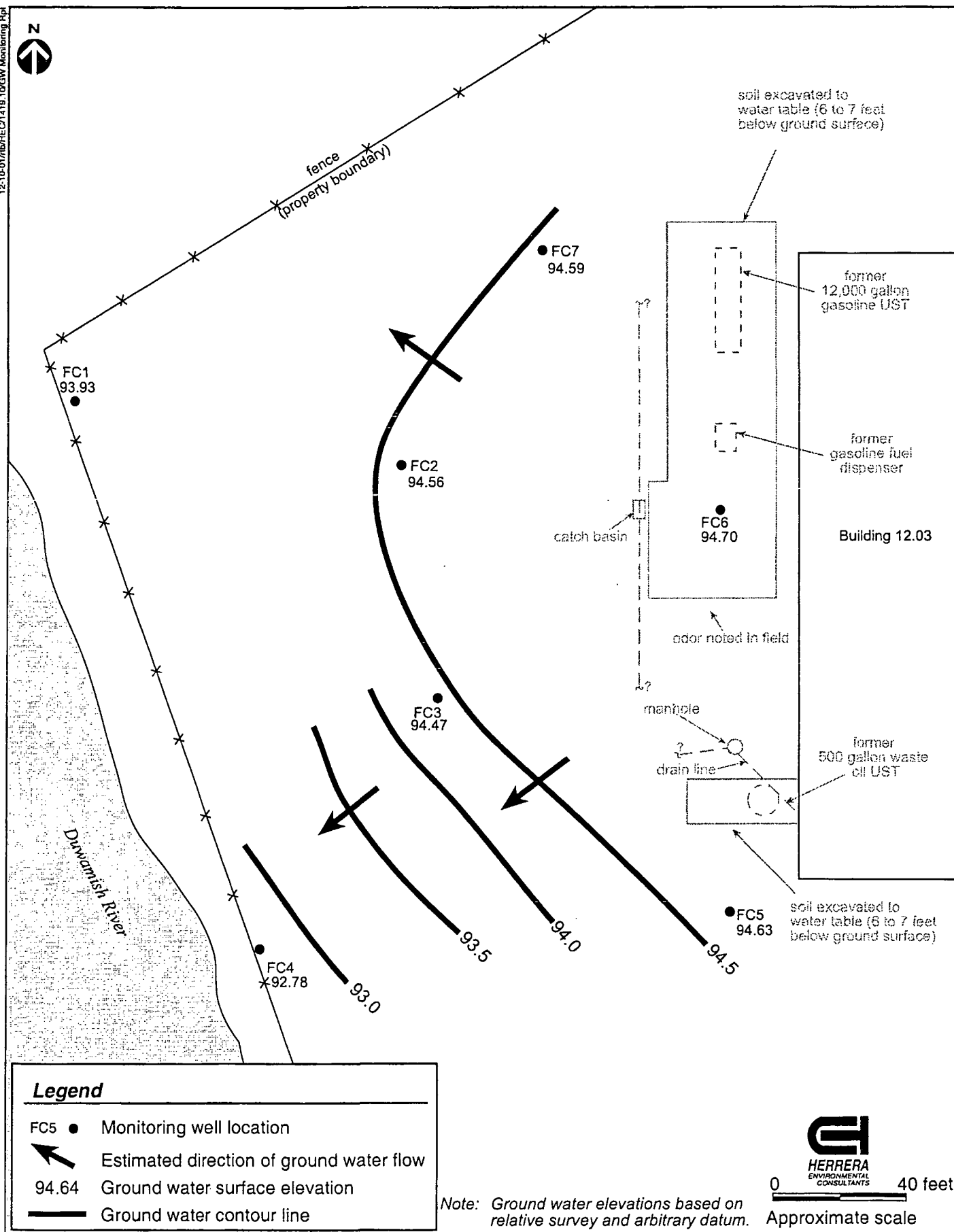


Figure C-5. Water level contour map, July 20, 2000, Federal Center South, Seattle, Washington.

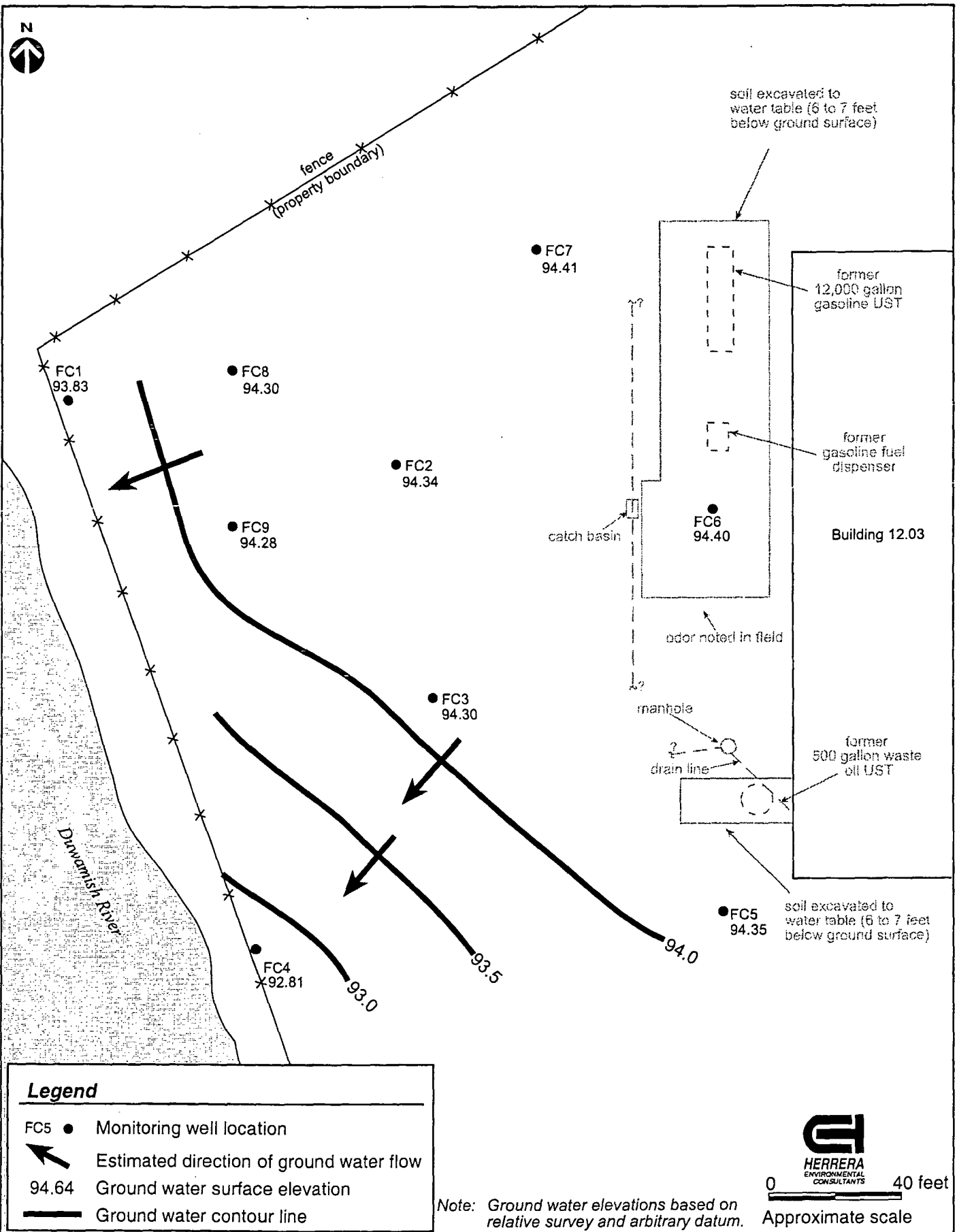


Figure C-6. Water level contour map, October 26, 2000, Federal Center South, Seattle, Washington.

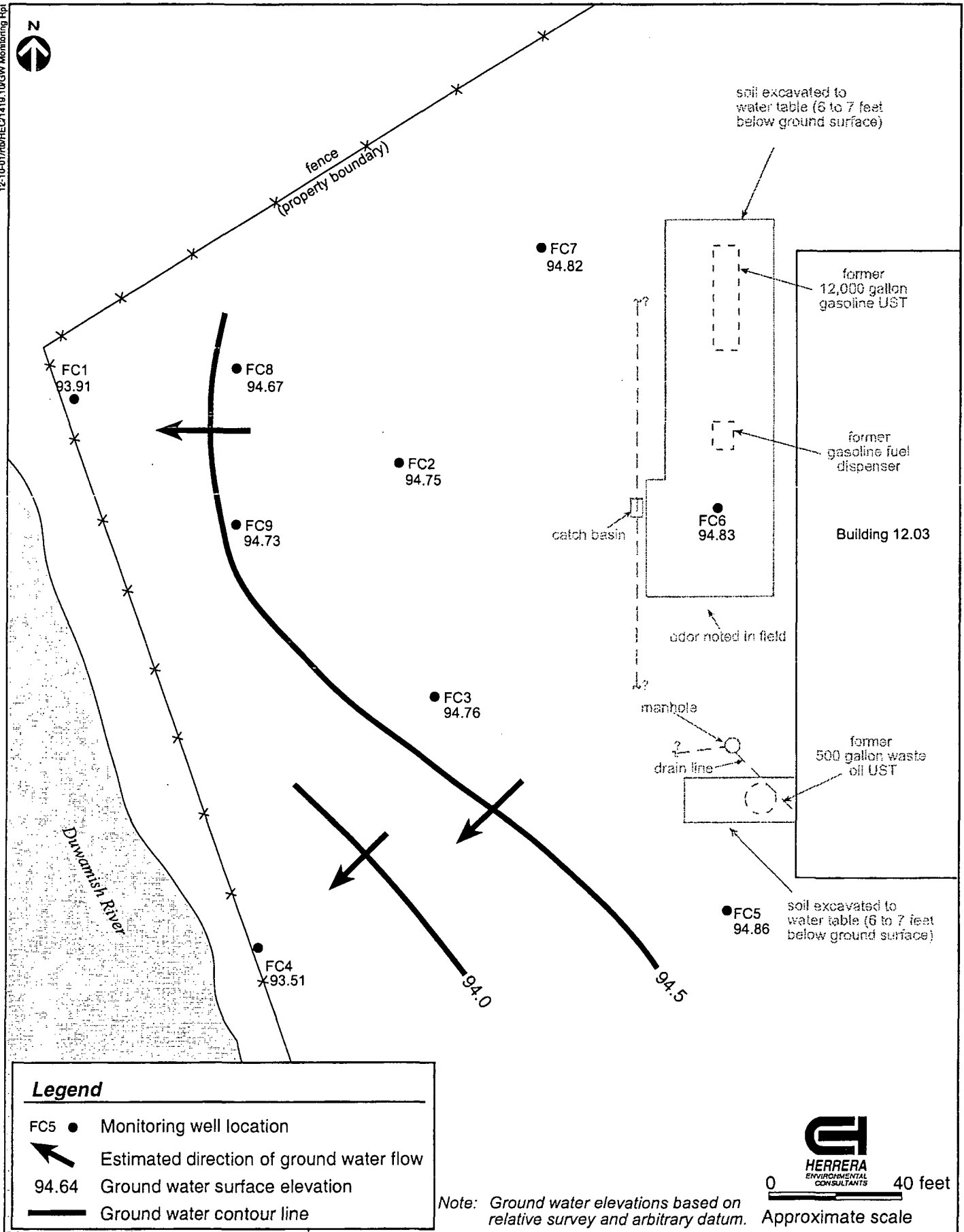


Figure C-7. Water level contour map, January 24, 2001, Federal Center South, Seattle, Washington.

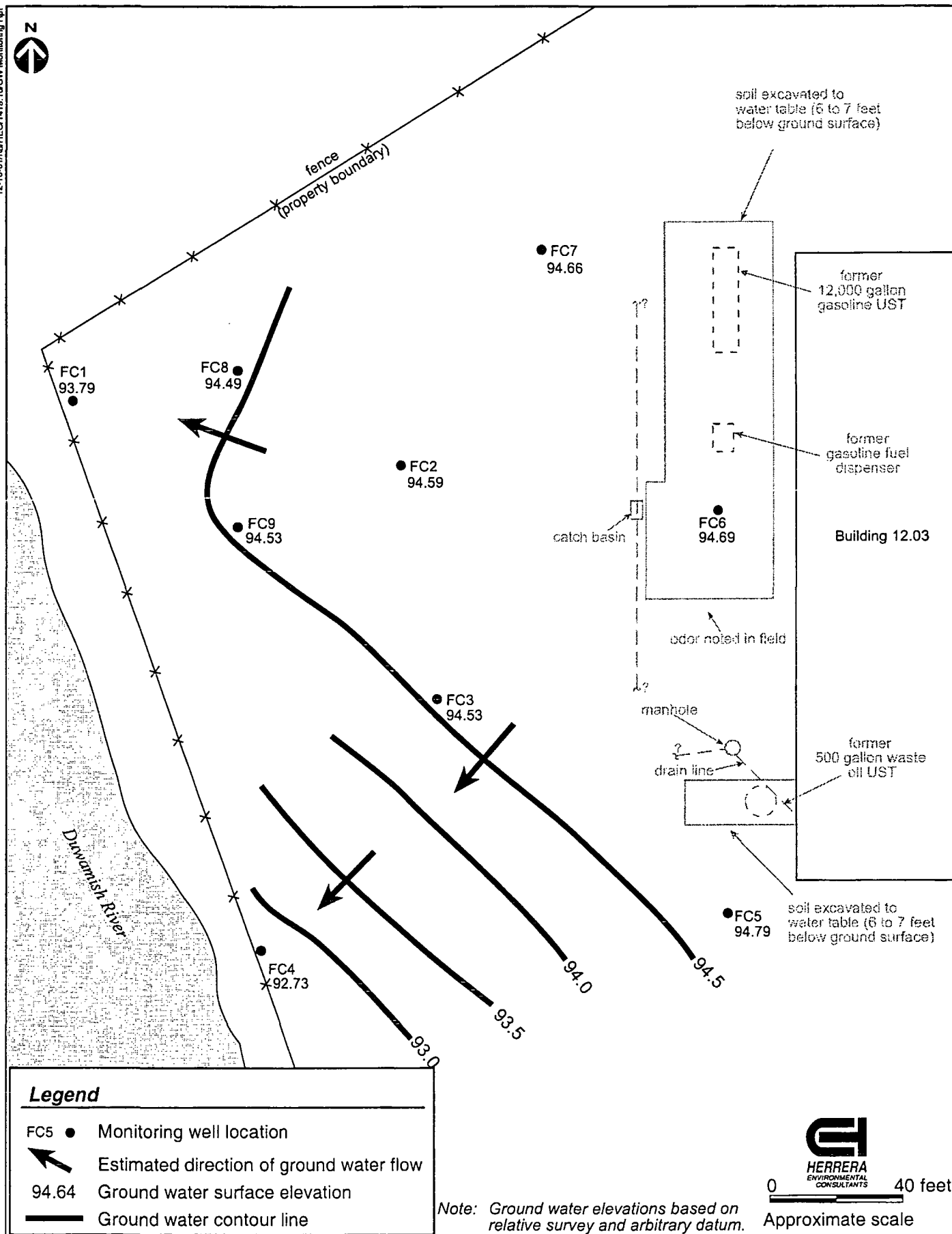


Figure C-8. Water level contour map, April 26, 2001, Federal Center South, Seattle, Washington.

## APPENDIX D

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### Tidal Fluctuation Data

# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Tuesday, July 6, 1999

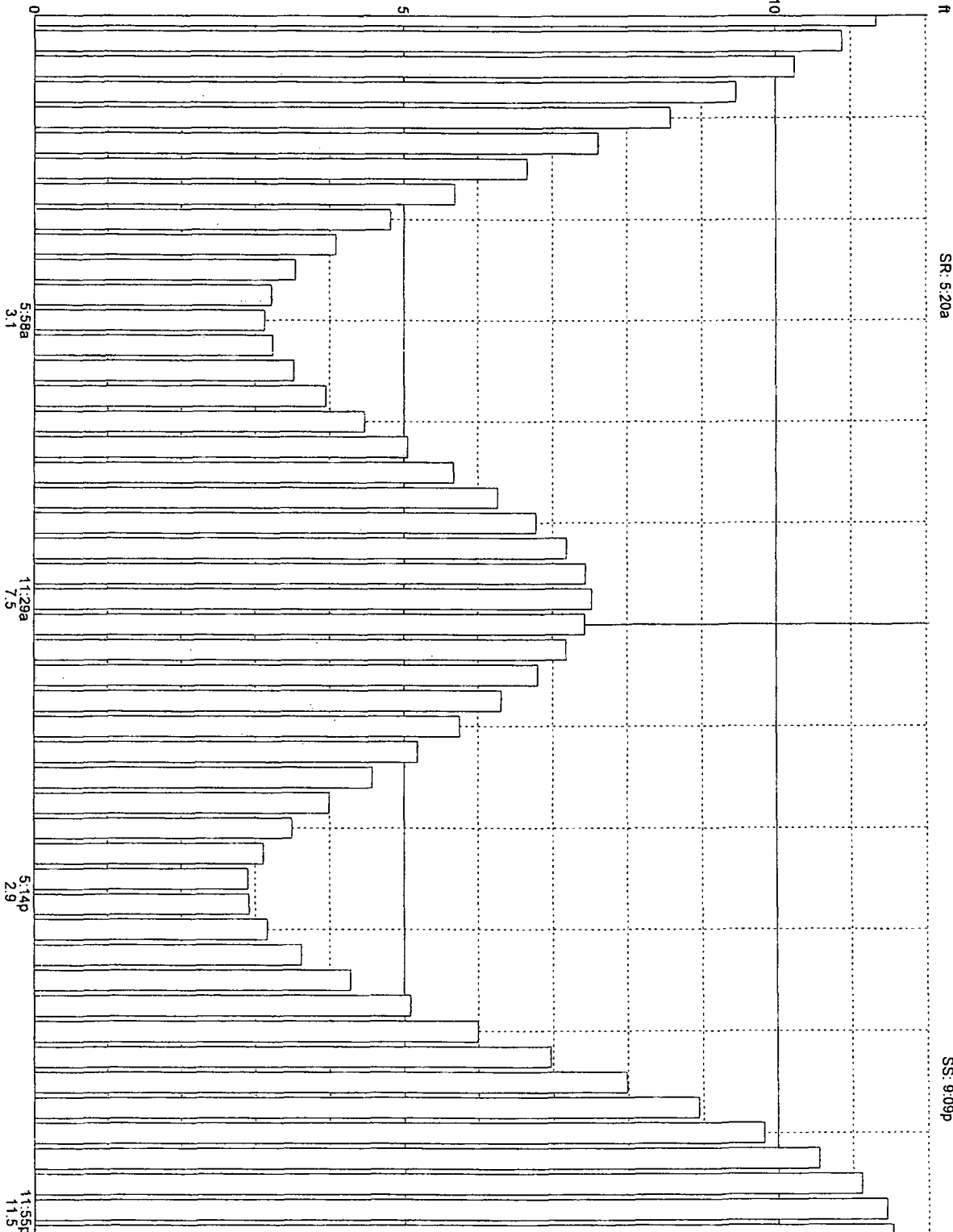
Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Daily Highs & Lows  
5:58a 3.1 ft Low  
11:29a 7.5 ft High  
5:14p 2.9 ft Low  
11:55p 11.5 ft High



(PDT) Tide

12:00a 11.3 ft  
12:30a 10.9 ft  
1:00a 10.3 ft  
1:30a 9.5 ft  
2:00a 8.6 ft  
2:30a 7.6 ft  
3:00a 6.7 ft  
3:30a 5.7 ft  
4:00a 4.8 ft  
4:30a 4.1 ft  
5:00a 3.5 ft  
5:30a 3.2 ft  
6:00a 3.1 ft  
6:30a 3.2 ft  
7:00a 3.5 ft  
7:30a 4.0 ft  
8:00a 4.5 ft  
8:30a 5.1 ft  
9:00a 5.7 ft  
9:30a 6.3 ft  
10:00a 6.8 ft  
10:30a 7.2 ft  
11:00a 7.4 ft  
11:30a 7.5 ft  
12:00p 7.4 ft  
12:30p 7.2 ft  
1:00p 6.8 ft  
1:30p 6.3 ft  
2:00p 5.8 ft  
2:30p 5.2 ft  
3:00p 4.6 ft  
3:30p 4.0 ft  
4:00p 3.5 ft  
4:30p 3.1 ft  
5:00p 2.9 ft  
5:30p 2.9 ft  
6:00p 3.2 ft  
6:30p 3.6 ft  
7:00p 4.3 ft  
7:30p 5.1 ft  
8:00p 6.0 ft  
8:30p 7.0 ft  
9:00p 8.0 ft  
9:30p 8.9 ft  
10:00p 9.8 ft  
10:30p 10.6 ft  
11:00p 11.1 ft  
11:30p 11.4 ft  
12:00a 11.5 ft



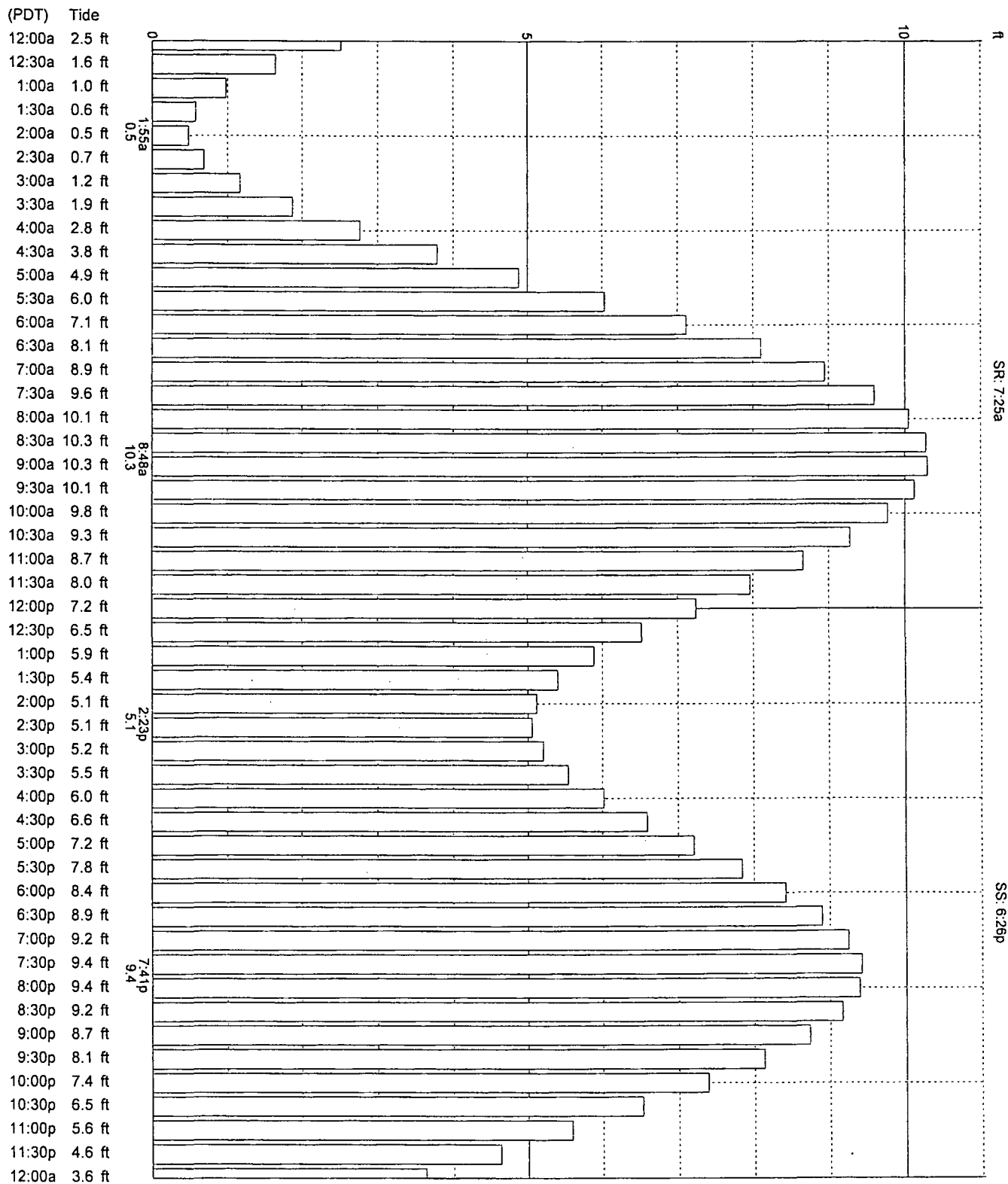
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Wednesday, October 13, 1999

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Daily Highs & Lows  
1:55a 0.5 ft Low  
8:48a 10.3 ft High  
2:23p 5.1 ft Low  
7:41p 9.4 ft High



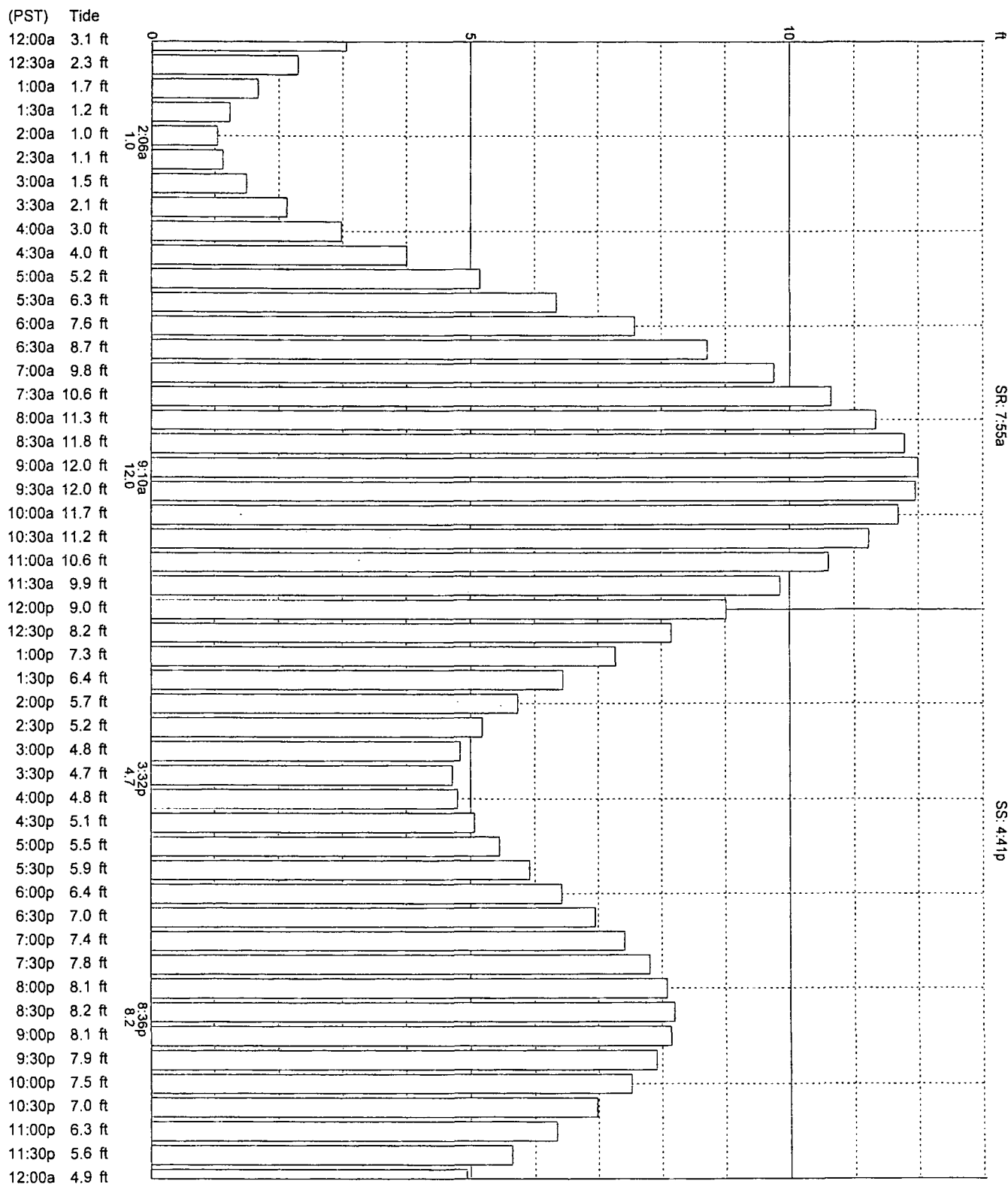
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Wednesday, January 12, 2000

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Daily Highs & Lows  
2:06a 1.0 ft Low  
9:10a 12.0 ft High  
3:32p 4.7 ft Low  
8:36p 8.2 ft High





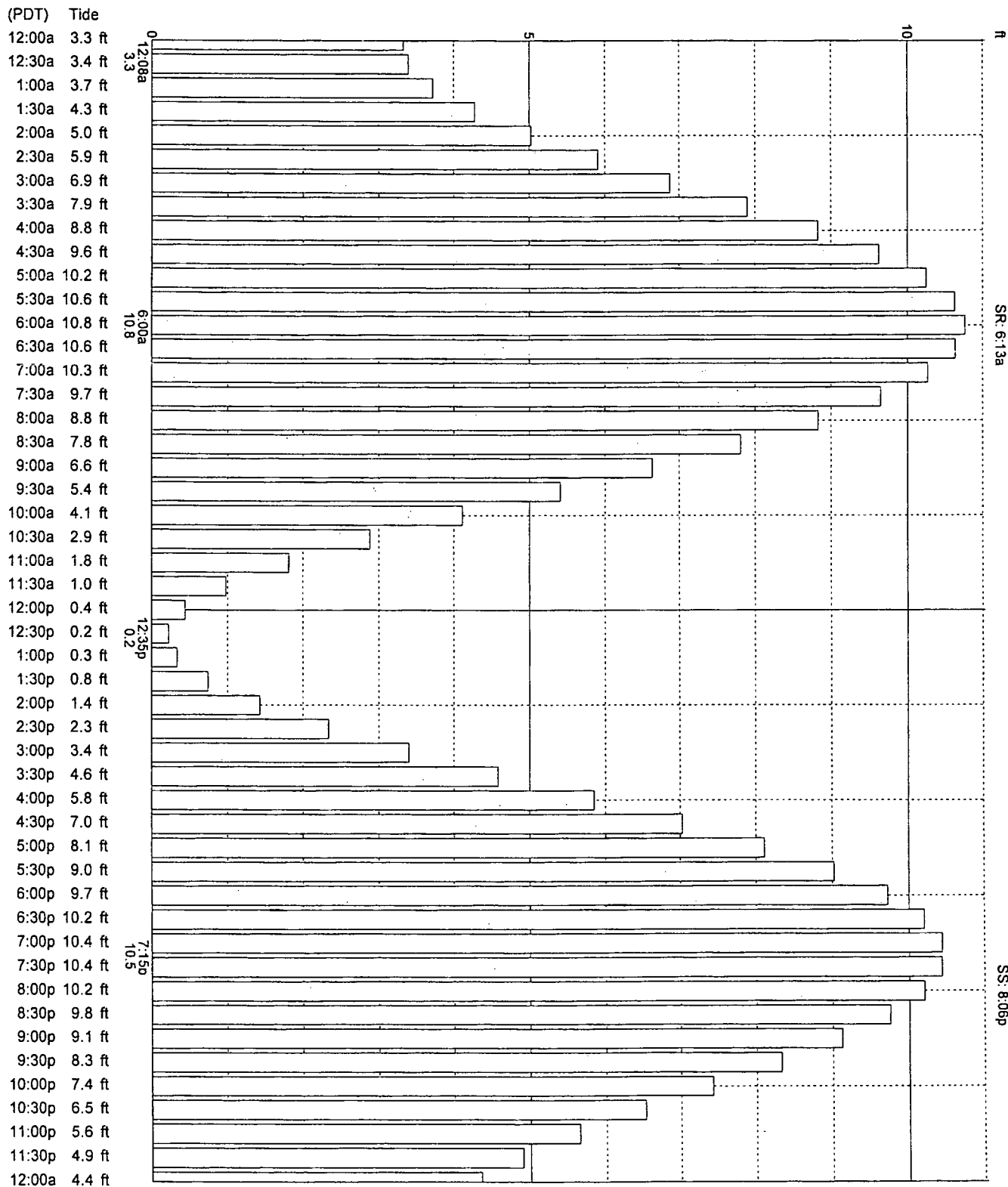
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Wednesday, April 19, 2000

Daily Highs & Lows  
12:08a 3.3 ft Low  
6:00a 10.8 ft High  
12:35p 0.2 ft Low  
7:15p 10.5 ft High



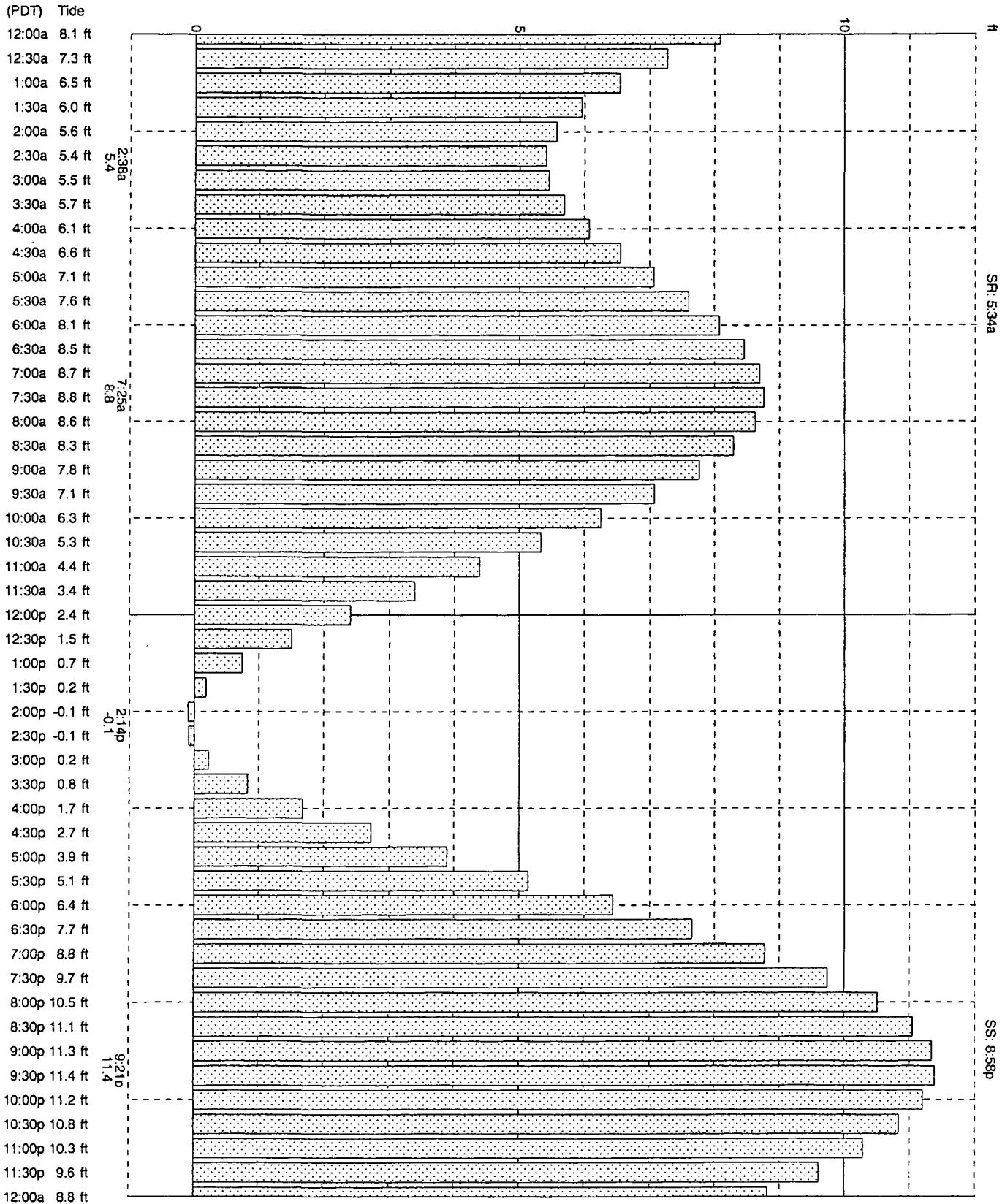
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Thursday, July 20, 2000

Daily Highs & Lows  
2:38a 5.4 ft Low  
7:25a 8.8 ft High  
2:14p -0.1 ft Low  
9:21p 11.4 ft High



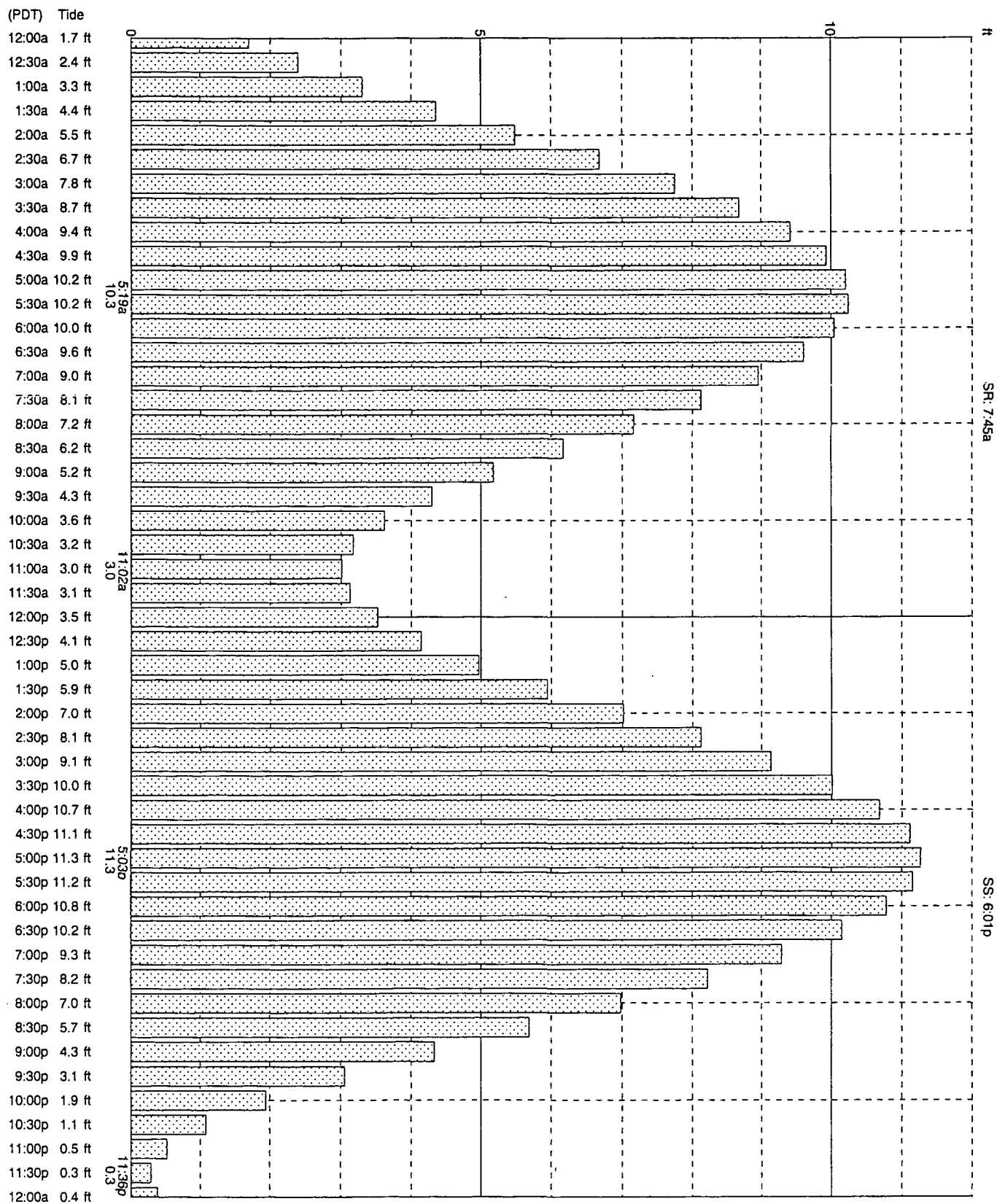
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Thursday, October 26, 2000

Daily Highs & Lows  
5:19a 10.3 ft High  
11:02a 3.0 ft Low  
5:03p 11.3 ft High  
11:36p 0.3 ft Low



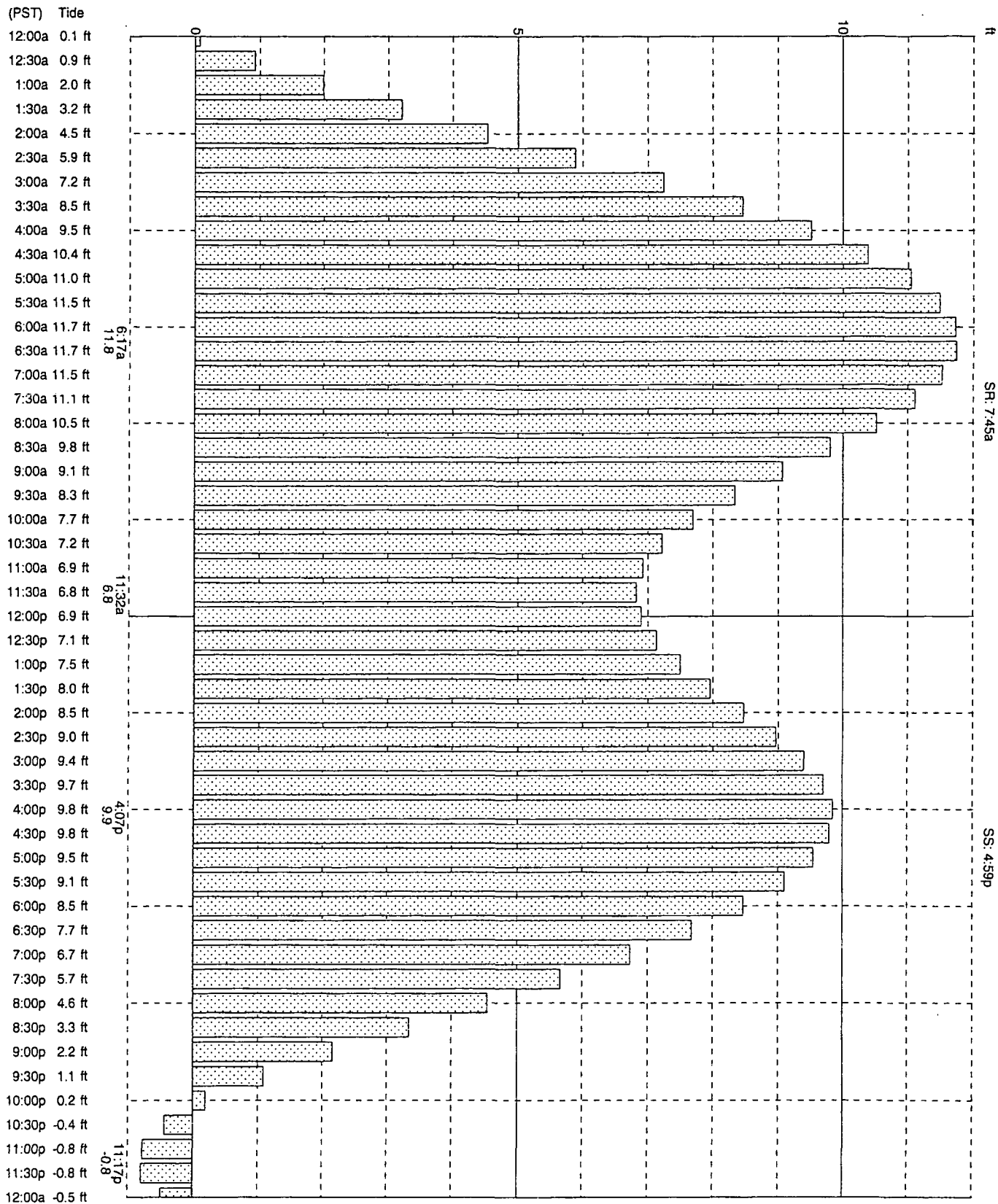
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Wednesday, January 24, 2001

Daily Highs & Lows  
6:17a 11.8 ft High  
11:32a 6.8 ft Low  
4:07p 9.9 ft High  
11:17p -0.8 ft Low



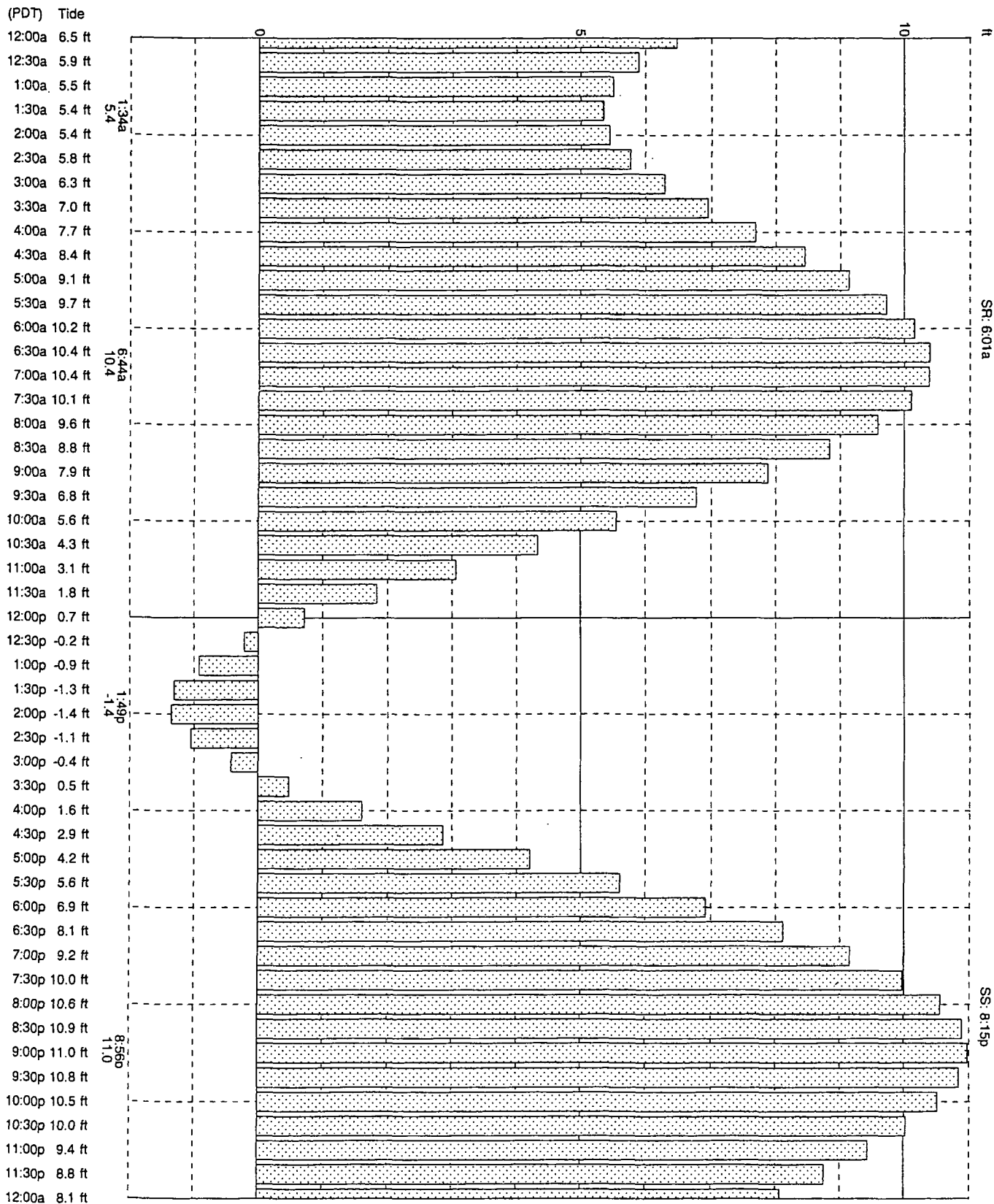
# Tides-Duwamish Waterway, Eighth Ave. South

based on Seattle, Washington (NOAA)  
47° 32.10 N 122° 19.30 W

Average Tides  
Mean Range: 7.5 ft  
MHHW: 11.1 ft  
Mean Tide: 6.4 ft

Thursday, April 26, 2001

Daily Highs & Lows  
1:34a 5.4 ft Low  
6:44a 10.4 ft High  
1:49p -1.4 ft Low  
8:56p 11.0 ft High



## APPENDIX E

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# Data Quality Assurance Review

## Data Quality Assurance Review

### QA Review for July 6, 1999 Sampling Event

The analysis of seven ground water samples collected from wells FC1 through FC7 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

Surrogate Recoveries—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (82 to 91 percent recovery) for NWTPH-G/BTEX and (51 to 75 percent recovery) for NWTPH-Dx.

Laboratory Control Spiked Samples—Percent recoveries of BTEX compounds in the MS/MSD analysis (90 to 93 percent recoveries) were within acceptable quality control limits.

Laboratory Duplicates—The RPD value (7.4 percent) calculated from the percent recovery of benzene in the quality control sample pair is acceptable. RPD values calculated from the percent recoveries of BTEX compounds in the spiked sample pair (0.24 to 1.0 percent RPD) are considered acceptable. An RPD value was not calculated from the diesel fuel quality control sample pair because no diesel-range hydrocarbons were detected above practical quantitation limits in either sample.

Laboratory Flags—The laboratory flagged the gasoline-range hydrocarbon concentration (500 µg/L) detected in samples collected from well FC6 because the sample chromatogram does not match the chromatogram of the gasoline-range hydrocarbon standard. The lab identified the contaminant as either a weathered gasoline or diesel #1 fuel based on the sample chromatogram (OnSite 1999).

### QA Review for October 13, 1999 Sampling Event

The analysis of seven ground water samples collected from wells FC1 through FC7 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

**Surrogate Recoveries**—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (81 to 106 percent recovery) for NWTPH-G/BTEX and (64 to 65 percent recovery) for NWTPH-Dx.

**Laboratory Control Spiked Samples**—Percent recoveries of BTEX compounds in the MS/MSD analysis (82 to 92 percent recoveries) were within acceptable quality control limits.

**Laboratory Duplicates**—RPD values were unable to be calculated for the BTEX compounds, gasoline-range hydrocarbons, and diesel-range hydrocarbons quality control sample pair because no compounds were detected above practical quantitation limits in either sample.

**Laboratory Flags**—None of the data was flagged by the laboratory in this data package.

## **QA Review for January 12, 2000 Sampling Event**

The analysis of seven ground water samples collected from wells FC1 through FC7 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

**Method Blanks**—There were no contaminants in the blanks detected above the instrument detection limit.

**Surrogate Recoveries**—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (86 to 106 percent recovery) for NWTPH-G/BTEX and (51 to 89 percent recovery) for NWTPH-Dx.

**Laboratory Control Spiked Samples**—Percent recoveries of BTEX compounds in the MS/MSD analysis (96 to 105 percent recoveries) were within acceptable quality control limits.

**Laboratory Duplicates**—RPD values were unable to be calculated for BTEX and gasoline-range hydrocarbons quality control sample pair because no compounds were detected above practical quantitation limits in either sample. Only one of the samples in the diesel-range hydrocarbons quality control sample pair was detected above the practical quantitation limit and RPD values were unable to be calculated. These data were not flagged because the reported concentration was within  $\pm$  the practical quantitation limit.

**Laboratory Flags**—None of the data was flagged by the laboratory in this data package.



## QA Review for April 19, 2000 Sampling Event

The analysis of seven ground water samples collected from wells FC1 through FC7 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

Surrogate Recoveries—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (76 to 108 percent recovery) for NWTPH-G/BTEX and (69 to 106 percent recovery) for NWTPH-Dx.

Laboratory Control Spiked Samples—Percent recoveries of BTEX compounds in the MS/MSD analysis (90 to 100 percent recoveries) were within acceptable quality control limits.

Laboratory Duplicates—RPD values were unable to be calculated for toluene, ethylbenzene, total xylenes, gasoline-range hydrocarbons and diesel-range hydrocarbons quality control sample pair because no compounds were detected above practical quantitation limits in either sample. An RPD (7.5) was calculated for the benzene quality control sample pair and it was within acceptable control limits.

Laboratory Flags—None of the data was flagged by the laboratory in this data package.

## QA Review for July 20 and 26, 2000 Sampling Events

The analysis of seven ground water samples collected from wells FC1 through FC7 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

Surrogate Recoveries—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (91 to 106 percent recovery) for NWTPH-G/BTEX and (62 to 92 percent recovery) for NWTPH-Dx.

Laboratory Control Spiked Samples—Percent recoveries of BTEX compounds in the MS/MSD analysis (93 to 112 percent recoveries) were within acceptable quality control limits.

Laboratory Duplicates—RPD values were unable to be calculated for BTEX, gasoline-range hydrocarbons and diesel-range hydrocarbons quality control sample pair because no compounds were detected above practical quantitation limits in either sample.

Laboratory Flags—None of the data was flagged by the laboratory in this data package.

## QA Review for October 26, 2000 Sampling Event

The analysis of nine ground water samples collected from wells FC1 through FC9 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

Surrogate Recoveries—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (94 to 105 percent recovery) for NWTPH-G/BTEX and (62 to 110 percent recovery) for NWTPH-Dx.

Laboratory Control Spiked Samples—Percent recoveries of BTEX compounds in the MS/MSD analysis (107 to 111 percent recoveries) were within acceptable quality control limits.

Laboratory Duplicates—RPD values were unable to be calculated for BTEX, gasoline-range hydrocarbons and diesel-range hydrocarbons quality control sample pair because no compounds were detected above practical quantitation limits in either sample.

Laboratory Flags—None of the data was flagged by the laboratory in this data package.

## QA Review for January 24, 2001 Sampling Event

The analysis of nine ground water samples collected from wells FC1 through FC9 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

Method Blanks—There were no contaminants in the blanks detected above the instrument detection limit.

**Surrogate Recoveries**—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (82 to 86 percent recovery) for NWTPH-G/BTEX and (77 to 96 percent recovery) for NWTPH-Dx.

**Laboratory Control Spiked Samples**—Percent recoveries of BTEX compounds in the MS/MSD analysis (95 to 99 percent recoveries) were within acceptable quality control limits.

**Laboratory Duplicates**—RPD values calculated from the percent recoveries of BTEX compounds in the spiked sample pair (1.7 to 1.9 percent) are considered acceptable. An RPD value was not calculated from the diesel quality control sample pair because no diesel-range hydrocarbons were detected above practical quantitation limits in either sample.

**Laboratory Flags**—None of the data was flagged by the laboratory in this data package.

## **QA Review for April 26, 2001 Sampling Event**

The analysis of nine ground water samples collected from wells FC1 through FC9 for TPH and BTEX analyses were determined to be acceptable for use based on the following criteria:

**Method Blanks**—There were no contaminants in the blanks detected above the instrument detection limit.

**Surrogate Recoveries**—All of the samples had percent recoveries of surrogates within the acceptable control limit ranges (74 to 101 percent recovery) for NWTPH-G/BTEX and (95 to 108 percent recovery) for NWTPH-Dx.

**Laboratory Control Spiked Samples**—Percent recoveries of BTEX compounds in the MS/MSD analysis (109 to 112 percent recoveries) were within acceptable quality control limits.

**Laboratory Duplicates**—RPD values calculated from the percent recoveries of BTEX compounds in the spiked sample pair (0.36 to 0.80 percent) are considered acceptable. RPD values were not calculated from the gasoline range/BTEX or diesel fuel quality control sample pairs because no BTEX/gasoline- or diesel-range hydrocarbons were detected above practical quantitation limits in either sample.

**Laboratory Flags**—None of the data was flagged by the laboratory in this data.

## APPENDIX F

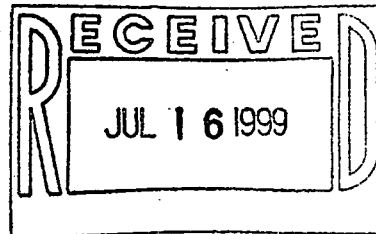
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# Laboratory Analytical Reports and Chain-of-Custody Record



**OnSite  
Environmental Inc.**

Analytical Testing and Mobile Laboratory Services



July 13, 1999

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6th Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.30  
Laboratory Reference No. 9907-027

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on July 7, 1999.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 7-8-99  
Date Analyzed: 7-8&9-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC1-1**  
Lab ID: 07-027-01

**FC2-1**  
07-027-02

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>5.1</b>		1.0
Toluene	<b>ND</b>		1.0	<b>12</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>91</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>160</b>		5.0
o-Xylene	<b>ND</b>		1.0	<b>15</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>820</b>		100
Surrogate Recovery:						
Fluorobenzene	91%			86%		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 7-8-99  
Date Analyzed: 7-8&9-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC3-1**  
Lab ID: 07-027-03

**FC4-1**  
07-027-04

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	3.5		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	84%			82%		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 7-8-99  
Date Analyzed: 7-8-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC5-1**  
Lab ID: 07-027-05

**FC7-1**  
07-027-06

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>ND</b>		100
Surrogate Recovery:						
Fluorobenzene	88%			88%		



Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 7-8-99  
Date Analyzed: 7-8-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC6-1**  
Lab ID: 07-027-07

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0
Ethyl Benzene	<b>19</b>		1.0
m,p-Xylene	<b>9.4</b>		1.0
o-Xylene	<b>ND</b>		1.0
TPH-Gas	<b>500</b>	<b>T</b>	100
Surrogate Recovery:			
Fluorobenzene	<b>83%</b>		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-8-99  
Date Analyzed: 7-8-99

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0708W2

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	86%		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 7-8-99  
Date Analyzed: 7-9-99

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	07-027-03 Original	07-027-03 Duplicate	RPD	Flags
Benzene	3.51	3.78	7.4	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	84%	87%		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-G/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 7-8-99  
Date Analyzed: 7-8-99

Matrix: Water  
Units: ug/L (ppb)  
Spike Level: 50.0 ppb

Lab ID:	07-018-02 MS	Percent Recovery	07-018-02 MSD	Percent Recovery	RPD
Benzene	48.9	93	48.4	92	1.0
Toluene	45.7	91	45.3	91	0.84
Ethyl Benzene	55.3	91	55.0	90	0.75
m,p-Xylene	62.7	91	62.3	90	0.89
o-Xylene	46.1	92	46.0	92	0.24
Surrogate Recovery:					
Fluorobenzene	90%		89%		

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-Dx**

Date Extracted: 7-8-99  
Date Analyzed: 7-13-99

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC3-1	FC4-1	FC5-1
Lab ID:	07-027-03	07-027-04	07-027-05

Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	0.52	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	67%	51%	75%

Flags:

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-8-99  
Date Analyzed: 7-9-99

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0708W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 78%

Flags:

Date of Report: July 13, 1999  
Samples Submitted: July 7, 1999  
Lab Traveler: 07-027  
Project: 491.30

**NWTPH-Dx**  
**DUPLICATE QUALITY CONTROL**

Date Extracted: 7-8-99  
Date Analyzed: 7-13-99

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 07-027-05 07-027-05 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 75% 59%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

D - Data from 1:\_\_\_\_ dilution.

E - The value reported exceeds the quantitation range, and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

G - Insufficient sample quantity for duplicate analysis.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical gasoline.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a silica gel cleanup procedure.

Y - Sample extract treated with an acid cleanup procedure.

Z -

ND - Not Detected

MRL - Method Reporting Limit

PQL - Practical Quantitation Limit

RPD - Relative Percent Difference





Company:	Herrera Environmental
Project No.:	491.30
Project Name:	Fed Center South
Project Manager:	Bruce Carpenter

## Page 1 of 1

Laboratory No.	07-027
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☐ \_\_\_\_\_  
(other)

[illegible]

RELINQUISHED BY <i>James A. Caputo</i>	DATE <i>7/7/99</i>	RECEIVED BY <i>Rachel Anderson</i>	DATE <i>7/7/99</i>
FIRM <i>Herrera Environmental</i>	TIME <i>845</i>	FIRM <i>On Site</i>	TIME <i>11:00 AM</i>
RELINQUISHED BY	DATE	RECEIVED BY	DATE
FIRM	TIME	FIRM	TIME
REVIEWED BY	DATE REVIEWED		

COMMENTS:  
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**OnSite  
Environmental Inc.**  
Analytical Testing and Mobile Laboratory Services

October 25, 1999

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6th Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.30  
Laboratory Reference No. 9910-091

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on October 14, 1999.

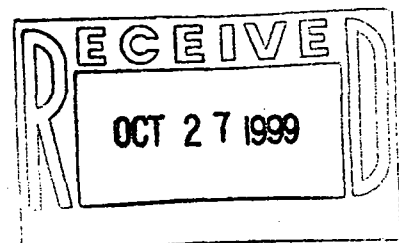
The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures



Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 10-14-99  
Date Analyzed: 10-14&15-99

Matrix: Water  
Units: ug/L (ppb)

Client ID:	<b>FC1-2</b>	<b>FC2-2</b>
Lab ID:	10-091-01	10-091-02

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>3.8</b>		1.0
Toluene	<b>ND</b>		1.0	<b>4.4</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>360</b>		10
m,p-Xylene	<b>ND</b>		1.0	<b>600</b>		10
o-Xylene	<b>ND</b>		1.0	<b>33</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>2700</b>		100
Surrogate Recovery:						
Fluorobenzene	89%			106%		

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC3-2**  
Lab ID: 10-091-03

**FC4-2**  
10-091-04

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>3.0</b>		<b>1.0</b>	<b>ND</b>		<b>1.0</b>
Toluene	<b>ND</b>		<b>1.0</b>	<b>ND</b>		<b>1.0</b>
Ethyl Benzene	<b>ND</b>		<b>1.0</b>	<b>ND</b>		<b>1.0</b>
m,p-Xylene	<b>ND</b>		<b>1.0</b>	<b>ND</b>		<b>1.0</b>
o-Xylene	<b>ND</b>		<b>1.0</b>	<b>ND</b>		<b>1.0</b>
TPH-Gas	<b>ND</b>		<b>100</b>	<b>ND</b>		<b>100</b>
Surrogate Recovery:						
Fluorobenzene	<b>90%</b>			<b>96%</b>		

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)

Client ID:	<b>FC5-2</b>	<b>FC6-2</b>
Lab ID:	10-091-05	10-091-06

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	1.0		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	81%			83%		

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC7-2  
Lab ID: 10-091-07

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	85%		

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB1014W2

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	89%		

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	10-091-01 Original	10-091-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	89%	89%		



Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-G/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 10-14-99  
Date Analyzed: 10-14-99

Matrix: Water  
Units: ug/L (ppb)  
Spike Level: 50.0 ppb

Lab ID:	10-088-03 MS	Percent Recovery	10-088-03 MSD	Percent Recovery	RPD
Benzene	45.1	90	46.0	92	2.0
Toluene	41.1	82	43.6	87	5.9
Ethyl Benzene	45.9	92	45.2	91	1.4
m,p-Xylene	45.2	91	45.4	91	0.42
o-Xylene	45.3	91	43.4	87	4.1

**Surrogate Recovery:**

Fluorobenzene	94%	92%
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Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Trayeler: 10-091  
Project: 491.30

**NWTPH-Dx**

Date Extracted: 10-19-99  
Date Analyzed: 10-20-99

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC3-2	FC4-2	FC5-2
Lab ID:	10-091-03	10-091-04	10-091-05

Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	ND	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	64%	64%	65%

Flags:

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

**NWTPH-Dx  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 10-19-99  
Date Analyzed: 10-19-99

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB1019W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 64%

Flags:

Date of Report: October 25, 1999  
Samples Submitted: October 14, 1999  
Lab Traveler: 10-091  
Project: 491.30

NWTPH-Dx  
DUPLICATE QUALITY CONTROL

Date Extracted: 10-19-99  
Date Analyzed: 10-20-99

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 10-091-05 10-091-05 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 65% 74%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1: \_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference



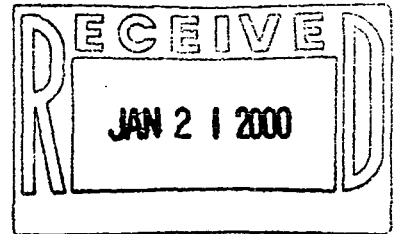
## Chain of Custody

[illegible]

RELINQUISHED BY <i>1300011111</i>	DATE <i>10/14/99</i>	RECEIVED BY <i>[Signature]</i>	DATE <i>10/14/99</i>	COMMENTS: <i>Sent Via Courier</i>
FIRM <i>Herrera Environmental</i>	TIME <i>8:55</i>	FIRM <i>OGE</i>	TIME <i>12:20</i>	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	
FIRM	TIME	FIRM	TIME	
REVIEWED BY	DATE REVIEWED			



**OnSite  
Environmental Inc.**  
Analytical Testing and Mobile Laboratory Services



January 20, 2000

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6th Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.30  
Laboratory Reference No. 0001-064

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on January 13, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,



David Baumeister  
Project Manager

Enclosures

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 1-14-00  
Date Analyzed: 1-14&17-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC1-3**  
Lab ID: 01-064-01

**FC2-3**  
01-064-02

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>33</b>		1.0
Toluene	<b>ND</b>		1.0	<b>1.2</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>6.5</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>100</b>		5.0
o-Xylene	<b>ND</b>		1.0	<b>1.4</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>1300</b>		100
Surrogate Recovery:						
Fluorobenzene	<b>94%</b>			<b>106%</b>		



Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 1-14-00  
Date Analyzed: 1-14-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC3-3**  
Lab ID: 01-064-03

**FC4-3**  
01-064-04

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>2.9</b>		1.0	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>ND</b>		100
Surrogate Recovery:						
Fluorobenzene	<b>93%</b>			<b>93%</b>		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 1-14-00  
Date Analyzed: 1-14&17-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC5-3**  
Lab ID: 01-064-05

**FC6-3**  
01-064-06

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	3.4		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	230		100
Surrogate Recovery:						
Fluorobenzene	86%			89%		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX**

Date Extracted: 1-14-00  
Date Analyzed: 1-14-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC7-3  
Lab ID: 01-064-07

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	94%		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-14-00  
Date Analyzed: 1-14-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0114W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	93%		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-17-00  
Date Analyzed: 1-17-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0117W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	84%		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 1-14-00  
Date Analyzed: 1-14-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	01-065-01 Original	01-065-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	81%	92%		

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-G/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 1-14-00  
Date Analyzed: 1-18-00

Matrix: Water  
Units: ug/L (ppb)  
Spike Level: 50.0 ppb

Lab ID:	01-064-01 MS	Percent Recovery	01-064-01 MSD	Percent Recovery	RPD
Benzene	51.8	104	48.0	96	7.7
Toluene	51.9	104	48.5	97	6.7
Ethyl Benzene	52.2	104	49.7	99	4.9
m,p-Xylene	52.6	105	50.0	100	4.9
o-Xylene	52.3	105	49.6	99	5.3

**Surrogate Recovery:**

Fluorobenzene	94%	81%
---------------	-----	-----

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-Dx**

Date Extracted: 1-17-00  
Date Analyzed: 1-17-00

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC3-3	FC4-3	FC5-3
Lab ID:	01-064-03	01-064-04	01-064-05

Diesel Fuel:	0.39	0.89	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	0.63	ND	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	82%	51%	89%

Flags:



Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-17-00  
Date Analyzed: 1-17-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0117W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 82%

Flags:

Date of Report: January 20, 2000  
Samples Submitted: January 13, 2000  
Lab Traveler: 01-064  
Project: 491.30

**NWTPH-Dx**  
**DUPLICATE QUALITY CONTROL**

Date Extracted: 1-17-00  
Date Analyzed: 1-17-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 01-064-05 01-064-05 DUP

Diesel Fuel: ND 0.310

PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 89% 99%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

D - Data from 1:\_\_\_\_ dilution.

E - The value reported exceeds the quantitation range, and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

G - Insufficient sample quantity for duplicate analysis.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical \_\_\_\_\_.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a silica gel cleanup procedure.

Y - Sample extract treated with an acid cleanup procedure.

Z -

ND - Not Detected

MRL - Method Reporting Limit

PQL - Practical Quantitation Limit

RPD - Relative Percent Difference



# Chain of Custody

Company:	Herrera Environmental
Project No.:	491.30
Project Name:	Federal Center South
Project Manager:	Bruce Carpenter

[illegible]

RELINQUISHED BY <i>Bernard A. Corp</i>	DATE <i>1/13/00</i>	RECEIVED BY <i>[Signature]</i>	DATE	COMMENTS: <i>Sent Via Courier</i>
FIRM <i>Herrera Environmental</i>	TIME <i>9:00</i>	FIRM <i>OSE</i>	TIME	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	
FIRM	TIME	FIRM	TIME	
REVIEWED BY	DATE REVIEWED			
Chromatographs with final report <input type="checkbox"/>				

**DISTRIBUTION LEGEND:** White - OnSite Copy    Yellow - Report Copy    Pink - Client Copy

APR 28 2000



**OnSite  
Environmental Inc.**

Analytical Testing and Mobile Laboratory Services

April 26, 2000

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.33  
Laboratory Reference No. 0004-113

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on April 20, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX**

Date Extracted: 4-21-00  
Date Analyzed: 4-21-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC4-4a**  
Lab ID: 04-113-01

**FC5-4**  
04-113-02

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	76%			98%		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX**

Date Extracted: 4-21-00  
Date Analyzed: 4-21-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC6-4**  
Lab ID: 04-113-03

**FC7-4**  
04-113-04

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>2.4</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>240</b>		100	<b>ND</b>		100
Surrogate Recovery:						
Fluorobenzene	<b>104%</b>			<b>103%</b>		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX**

Date Extracted: 4-21-00  
Date Analyzed: 4-21-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC4-4b  
Lab ID: 04-113-05

FC1-4  
04-113-06

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	103%			88%		



Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX**

Date Extracted: 4-21&24-00  
Date Analyzed: 4-21&24-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC3-4  
Lab ID: 04-113-07

FC2-4  
04-113-08

	Result	Flags	PQL	Result	Flags	PQL
Benzene	4.5		1.0	19		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	43		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	1200		100
Surrogate Recovery:						
Fluorobenzene	89%			108%		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 4-21-00  
Date Analyzed: 4-21-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0421W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	107%		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0424W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	98%		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	04-113-07 Original	04-113-07 Duplicate	RPD	Flags
Benzene	4.47	4.15	7.5	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	89%	101%		

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-G/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: ug/L (ppb)  
Spike Level: 50.0 ppb

Lab ID:	04-113-07 MS	Percent Recovery	04-113-07 MSD	Percent Recovery	RPD
Benzene	51.0	93	52.5	96	2.7
Toluene	47.4	95	49.3	99	3.9
Ethyl Benzene	47.3	95	49.7	99	4.9
m,p-Xylene	47.5	95	49.2	98	3.6
o-Xylene	44.9	90	50.0	100	11

Surrogate Recovery:

Fluorobenzene	106%	101%
---------------	------	------

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-Dx**

Date Extracted: 4-24-00  
Date Analyzed: 4-24&26-00

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC4-4a	FC5-4	FC4-4b
Lab ID:	04-113-01	04-113-02	04-113-05

Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	ND	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	103%	86%	69%

Flags:

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-Dx**

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: mg/L (ppm)

Client ID: FC3-4  
Lab ID: 04-113-07

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 106%

Flags:

Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0424W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 93%

Flags:



Date of Report: April 26, 2000  
Samples Submitted: April 20, 2000  
Lab Traveler: 04-113  
Project: 491.33

NWTPH-Dx  
DUPLICATE QUALITY CONTROL

Date Extracted: 4-24-00  
Date Analyzed: 4-24-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 04-111-01 04-111-01 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 73% 76%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1:\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference



# Chain of Custody

Company:	Hersesa Environmental
Project No.:	491.33
Project Name:	Federal Center South
Project Manager:	Bruce Carpenter

**Turnaround Request**  
(in working days)

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Day ☐ 3 Day

☒ Standard  
(Hydrocarbon analyses: 5 days,  
All other analyses: 7 days)

☐ \_\_\_\_\_  
(other)

Project Chemist: 	Laboratory No. 04-113
--	-----------------------

**Requested Analysis**

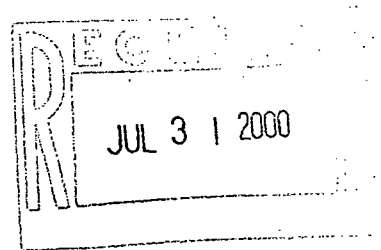
[illegible]

RELINQUISHED BY <i>1 Sam A. Crompton</i>	DATE <i>4/20/00</i>	RECEIVED BY <i>[Signature]</i>	DATE <i>4/20/00</i>	COMMENTS:  <i>Sent Via Courier</i>
FIRM <i>Hersco Environmental</i>	TIME <i>9:45</i>	FIRM <i>OST</i>	TIME <i>11:25 AM</i>	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	
FIRM	TIME	FIRM	TIME	
REVIEWED BY		DATE REVIEWED		Chromatographs with final report <input type="checkbox"/>



**OnSite  
Environmental Inc.**

Analytical Testing and Mobile Laboratory Services



July 27, 2000

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.30  
Laboratory Reference No. 0007-148

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on July 21, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX**

Date Extracted: 7-24-00  
Date Analyzed: 7-24-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC1-45**  
Lab ID: 07-148-01

**FC2-45**  
07-148-02

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	4.2		1.0
Toluene	1.2		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	1.0		1.0	13		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	470		100
Surrogate Recovery:						
Fluorobenzene	94%			102%		

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX**

Date Extracted: 7-24&25-00  
Date Analyzed: 7-24&25-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: <sup>BAC</sup>FC3-~~45~~  
Lab ID: 07-148-03

<sup>BAC</sup>FC5-~~45~~  
07-148-04

	Result	Flags	PQL	Result	Flags	PQL
Benzene	1.3		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	99%			106%		

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX**

Date Extracted: 7-24&25-00  
Date Analyzed: 7-24&25-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: <sup>BAC</sup>FC6-45  
Lab ID: 07-148-05

<sup>BAC</sup>FC7-45  
07-148-06

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	160		100	ND		100
Surrogate Recovery:						
Fluorobenzene	103%			95%		

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-24-00  
Date Analyzed: 7-24-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0724W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	97%		



Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-25-00  
Date Analyzed: 7-25-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0725W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	104%		

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Gx/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 7-25-00  
Date Analyzed: 7-25-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	07-148-05 Original	07-148-05 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	159	158	0.63	
Surrogate Recovery:				
Fluorobenzene	103%	107%		

Date of Report: July 27, 2000  
 Samples Submitted: July 21, 2000  
 Lab Traveler: 07-148  
 Project: 491.30

**NWTPH-Gx/BTEX  
 MS/MSD QUALITY CONTROL**

Date Extracted: 7-24-00  
 Date Analyzed: 7-24-00

Matrix: Water  
 Units: ug/L (ppb)

Spike Level: 50.0 ppb

Lab ID:	07-148-05 MS	Percent Recovery	07-148-05 MSD	Percent Recovery	RPD	Flags
Benzene	55.9	112	55.4	111	0.92	
Toluene	54.4	109	54.0	108	0.79	
Ethyl Benzene	53.1	106	52.7	105	0.76	
m,p-Xylene	54.6	109	54.4	109	0.48	
o-Xylene	54.4	109	54.0	108	0.70	

Surrogate Recovery:

Fluorobenzene	107%	106%
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Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

## NWTPH-Dx

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Client ID:	<sup>3.12</sup> FC3- <del>45</del>	<sup>3.42</sup> FC5- <del>45</del>
Lab ID:	07-148-03	07-148-04

Diesel Fuel:	ND	ND
PQL:	0.25	0.25

Heavy Oil:	ND	ND
PQL:	0.50	0.50

Surrogate Recovery:		
o-Terphenyl	61%	66%

Flags:

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0726W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 85%

Flags:

Date of Report: July 27, 2000  
Samples Submitted: July 21, 2000  
Lab Traveler: 07-148  
Project: 491.30

NWTPH-Dx  
DUPLICATE QUALITY CONTROL

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 07-148-03 07-148-03 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 61% 78%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1:\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected at PQL
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference

# Chain of Custody

Company:  
*Herrera Environmental*

Project No.:  
*491.30*

Project Name:  
*Federal Center South*

Project Manager:  
*Bruce Carpenter*

**Turnaround Request  
(in working days)**

(Check One)

☐ Same Day      ☐ 1 Day

☐ 2 Day      ☐ 3 Day

☒ Standard  
(Hydrocarbon analyses: 5 days,  
All other analyses: 7 days)

☐ \_\_\_\_\_  
(other)

Project Chemist: \_\_\_\_\_

Laboratory No. \_\_\_\_\_

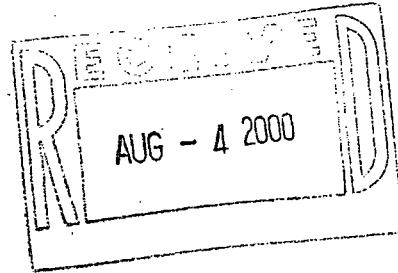
						Requested Analysis													
Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-GX/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C	PCBs by 8082	Pesticides by 8081	Total PCRA Metals (8)	ICLP Metals	VPH	EPH	% Moisture
1	FC1-45 BAC	7-20-00	14107	W	2		X												
2	FC2-45 BAC	↓	1320	↓	2		X												
3	FC3-45 BAC	✓	1340	↓	3		X	X											
	<del>FC4-4</del>			↓	<del>3</del>		<del>X</del>	<del>X</del>											
4	FC5-45 BAC	7-20-00	1052	↓	3		X	X											
5	FC6-45 BAC	↓	1157	↓	2		X												
6	FC7-45 BAC	✓	1250	✓	2		X												

RELINQUISHED BY <i>Mh Mh</i>	DATE 7-21-00	RECEIVED BY <i>[Signature]</i>	DATE 7-21-00	COMMENTS: <i>NO FC-4-5 BAC</i>
FIRM <i>Herrera</i>	TIME 1210	FIRM <i>[Signature]</i>	TIME 1215	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	
FIRM	TIME	FIRM	TIME	
REVIEWED BY		DATE REVIEWED		Chromatographs with final report <input type="checkbox"/>





**OnSite  
Environmental Inc.**  
Analytical Testing and Mobile Laboratory Services



August 3, 2000

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project C491.33  
Laboratory Reference No. 0007-178

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on July 26, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Gx/BTEX**

Date Extracted: 7-27-00  
Date Analyzed: 7-27-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC-445** <sup>3AL</sup>  
Lab ID: 07-178-01

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	91%		

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-27-00  
Date Analyzed: 7-27-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0727W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	89%		

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Gx/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 7-27-00  
Date Analyzed: 7-27-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	07-180-01 Original	07-180-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	88%	95%		

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Gx/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 7-27-00  
Date Analyzed: 7-27-00

Matrix: Water  
Units: ug/L (ppb)

Spike Level: 50.0 ppb

Lab ID:	07-180-01 MS	Percent Recovery	07-180-01 MSD	Percent Recovery	RPD	Flags
Benzene	47.7	95	47.8	96	0.21	
Toluene	46.9	94	46.7	93	0.41	
Ethyl Benzene	46.6	93	46.4	93	0.26	
m,p-Xylene	46.4	93	46.2	93	0.45	
o-Xylene	46.4	93	46.7	93	0.45	

Surrogate Recovery:

Fluorobenzene	93%	90%
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Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Dx**

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Client ID: FC-4-45 <sup>BAL</sup>  
Lab ID: 07-178-01

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 92%

Flags:

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0726W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 85%

Flags:

Date of Report: August 3, 2000  
Samples Submitted: July 26, 2000  
Lab Traveler: 07-178  
Project: C491.33

**NWTPH-Dx**  
**DUPLICATE QUALITY CONTROL**

Date Extracted: 7-26-00  
Date Analyzed: 7-26-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 07-148-03 07-148-03 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 61% 78%

Flags:





#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1:\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected at PQL
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference



## Chain of Custody

[illegible]



**OnSite  
Environmental Inc.**

Analytical Testing and Mobile Laboratory Services

November 3, 2000

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.55  
Laboratory Reference No. 0010-267

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on October 27, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures

NOV - 7 2000

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC1-6  
Lab ID: 10-267-01

FC2-6  
10-267-02

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	3.7		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	4.3		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	200		100
Surrogate Recovery: Fluorobenzene	100%			100%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 10-30&31-00  
Date Analyzed: 10-30&31-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC3-6**  
Lab ID: 10-267-03

**FC4-6**  
10-267-04

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>6.1</b>		1.0	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>ND</b>		100
Surrogate Recovery: Fluorobenzene	101%			105%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC5-6  
Lab ID: 10-267-05

FC6-6  
10-267-06

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	140		100
Surrogate Recovery:						
Fluorobenzene	101%			100%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC7-6  
Lab ID: 10-267-07

*8-31K*  
FC8-1  
10-267-08

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	8.5		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	5.2		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	140		100
Surrogate Recovery: Fluorobenzene	94%			102%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC9-1** *EAC*  
Lab ID: 10-267-09

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	99%		



Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB1030W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	105%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 10-31-00  
Date Analyzed: 10-31-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB1031W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery:			
Fluorobenzene	95%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	10-267-01 Original	10-267-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	100%	101%		

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Gx/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 10-30-00  
Date Analyzed: 10-30-00

Matrix: Water  
Units: ug/L (ppb)

Spike Level: 50.0 ppb

Lab ID:	10-267-01 MS	Percent Recovery	10-267-01 MSD	Percent Recovery	RPD	Flags
Benzene	54.5	109	53.7	107	1.6	
Toluene	55.0	110	54.0	108	1.7	
Ethyl Benzene	55.6	111	54.7	109	1.7	
m,p-Xylene	55.5	111	54.7	109	1.6	
o-Xylene	55.7	111	54.7	109	1.9	

Surrogate Recovery:

Fluorobenzene	100%	102%
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Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Dx**

Date Extracted: 10-27-00  
Date Analyzed: 10-27-00

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC3-6	FC4-6	FC5-6
Lab ID:	10-267-03	10-267-04	10-267-05

Diesel Fuel:	ND	ND	0.25
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	ND	0.56
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	75%	62%	109%

Flags:

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

## NWTPH-Dx

Date Extracted: 10-27-00  
Date Analyzed: 10-27-00

Matrix: Water  
Units: mg/L (ppm)

Client ID: FC9-<sup>6</sup>~~y~~ BAC  
Lab ID: 10-267-09

Diesel Fuel: 0.70  
PQL: 0.25

Heavy Oil: 3.3  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 110%

Flags:

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 10-27-00  
Date Analyzed: 10-27-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB1027W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 99%

Flags:

Date of Report: November 3, 2000  
Samples Submitted: October 27, 2000  
Lab Traveler: 10-267  
Project: 491.55

**NWTPH-Dx**  
**DUPLICATE QUALITY CONTROL**

Date Extracted: 10-27-00  
Date Analyzed: 10-27-00

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 10-267-03 10-267-03 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 75% 61%

Flags:





#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1:\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected at PQL
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference

# Chain of Custody

Company: Herrera Environmental  
Project No.: 491.55  
Project Name: Federal Center South  
Project Manager: Bruce Carpenter

Turnaround Request (in working days)		Project Chemist: <u>DB</u>	Laboratory No.														
(Check One)		Requested Analysis															
<input type="checkbox"/> Same Day	<input type="checkbox"/> 1 Day	NWTRHCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C	PCBs by 8082	Pesticides by 8081	Total RCRA Metals (8)	TCLP Metals	VPH	EPH			% Moisture
<input type="checkbox"/> 2 Day	<input type="checkbox"/> 3 Day																
<input checked="" type="checkbox"/> Standard	(Hydrocarbon analyses: 5 days, All other analyses: 7 days)																
<input type="checkbox"/> <u>11/3</u>	(other)																

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.
1	FC1-6	10/26/00	10:05	W	2
2	FC2-6		12:45		2
3	FC3-6		14:15		4
4	FC4-6		14:45		4
5	FC5-6		15:30		4
6	FC6-6		16:10		2
7	FC7-6		16:45		2
8	FC8-6		11:05		2
9	FC9-6	↓	13:05	↓	4

RELINQUISHED BY <u>Sam A. Capra</u>	DATE <u>10/27/00</u>	RECEIVED BY <u>[Signature]</u>	DATE <u>10/27/00</u>	COMMENTS:
FIRM <u>Herrera Environmental</u>	TIME <u>7:45</u>	FIRM <u>OnSite Env.</u>	TIME <u>7:45</u>	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	
FIRM	TIME	FIRM	TIME	
REVIEWED BY	DATE REVIEWED			

Chromatographs with final report ☐



**OnSite  
Environmental Inc.**  
Analytical Testing and Mobile Laboratory Services

February 2, 2001

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.55  
Laboratory Reference No. 0101-165

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on January 25, 2001.

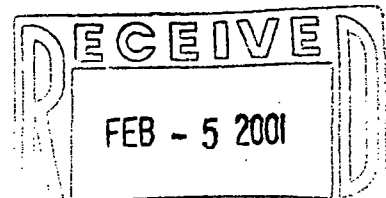
The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister  
Project Manager

Enclosures



Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC7-7**  
Lab ID: 01-165-01

**FC6-7**  
01-165-02

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>ND</b>		100
Surrogate Recovery:						
Fluorobenzene	82%			86%		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC5-7  
Lab ID: 01-165-03

FC1-7  
01-165-04

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	85%			85%		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: <sup>7</sup>FC8-2/~~3AC~~  
Lab ID: 01-165-05

<sup>7</sup>FC9-2/~~3AC~~  
01-165-06

	Result	Flags	PQL	Result	Flags	PQL
Benzene	1.8		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	3.9		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	83%			82%		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC2-7**  
Lab ID: 01-165-07

**FC3-7**  
01-165-08

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>3.0</b>		1.0	<b>4.0</b>		1.0
Toluene	<b>ND</b>		1.0	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100	<b>ND</b>		100
Surrogate Recovery: Fluorobenzene	<b>85%</b>			<b>85%</b>		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 1-26-01  
Date Analyzed: 1-26-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC4-7**  
Lab ID: 01-165-09

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0
Toluene	<b>1.7</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0
m,p-Xylene	<b>1.4</b>		1.0
o-Xylene	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100
Surrogate Recovery: Fluorobenzene	<b>85%</b>		



Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0125W1

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	<b>ND</b>		1.0
Toluene	<b>ND</b>		1.0
Ethyl Benzene	<b>ND</b>		1.0
m,p-Xylene	<b>ND</b>		1.0
o-Xylene	<b>ND</b>		1.0
TPH-Gas	<b>ND</b>		100
Surrogate Recovery:			
Fluorobenzene	89%		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0125W2

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100

Surrogate Recovery:  
Fluorobenzene

87%

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	01-154-01 Original	01-154-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	87%	91%		

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Gx/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 1-25-01  
Date Analyzed: 1-25-01

Matrix: Water  
Units: ug/L (ppb)

Spike Level: 50.0 ppb

Lab ID:	01-154-01 MS	Percent Recovery	01-154-01 MSD	Percent Recovery	RPD	Flags
Benzene	47.3	95	48.2	96	1.8	
Toluene	47.7	96	48.5	97	1.7	
Ethyl Benzene	48.4	97	49.3	99	1.9	
m,p-Xylene	48.5	97	49.4	99	1.9	
o-Xylene	48.4	97	49.3	98	1.7	

Surrogate Recovery:

Fluorobenzene	88%	90%
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Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Dx**

Date Extracted: 1-26-01  
Date Analyzed: 1-26&29-01

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC7-7	FC6-7	FC5-7
Lab ID:	01-165-01	01-165-02	01-165-03

Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	ND	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	84%	81%	86%

Flags:	Y
--------	---

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

## NWTPH-Dx

Date Extracted: 1-26-01  
Date Analyzed: 1-26&29-01

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC1-7	<sup>7</sup> FC8-2-BAC	<sup>7</sup> FC9-2-BAC
Lab ID:	01-165-04	01-165-05	01-165-06
Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25
Heavy Oil:	ND	ND	0.70
PQL:	0.50	0.50	0.50
Surrogate Recovery:			
o-Terphenyl	95%	90%	96%
Flags:			Y

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

## NWTPH-Dx

Date Extracted: 1-26-01  
Date Analyzed: 1-29-01

Matrix: Water  
Units: mg/L (ppm)

Client ID:	FC2-7	FC3-7	FC4-7
Lab ID:	01-165-07	01-165-08	01-165-09
Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25
Heavy Oil:	ND	ND	ND
PQL:	0.50	0.50	0.50
Surrogate Recovery:			
o-Terphenyl	86%	77%	90%
Flags:	Y	Y	Y

Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 1-26-01  
Date Analyzed: 1-29-01

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0126W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 95%

Flags: Y



Date of Report: February 2, 2001  
Samples Submitted: January 25, 2001  
Lab Traveler: 01-165  
Project: 491.55

NWTPH-Dx  
DUPLICATE QUALITY CONTROL

Date Extracted: 1-26-01  
Date Analyzed: 1-29-01

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 01-165-08 01-165-08 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 77% 90%

Flags: Y Y



#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1: \_\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - *Compound recovery is outside of the control limits.*
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- O - *Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.*
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected at PQL
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference

# Chain of Custody

Company: Herrera Environmental  
 Project No.: 491.55  
 Project Name: FCMON2  
 Project Manager: Bruce Carpenter

**Turnaround Request (in working days)**

(Check One)

☐ Same Day      ☐ 1 Day  
☐ 2 Day      ☐ 3 Day  
☒ Standard  
 (Hydrocarbon analyses: 5 days,  
 All other analyses: 7 days)  
☐ 2/1  
 (other)

Project Chemist: DB      Laboratory No. 01-165

		Requested Analysis																	
Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C	PCBs by 8082	Pesticides by 8081	Total RCRA Metals (8)	TCLP Metals	VPH	EPH	% Moisture
1	FC7-7	1/24/01	950	W	4		X	X											
2	FC6-7	"	1051	W	4		X	X											
3	FC5-7	"	1135	W	4		X	X											
4	FC1-7	"	1220	W	4		X	X											
5	FC8-27 <sup>ENC</sup>	"	1335	W	4		X	X											
6	FC9-27	"	1420	W	4		X	X											
7	FC2-7	"	1530	W	4		X	X											
8	FC3-7	"	1605	W	4		X	X											
9	FC4-7	"	1705	W	4		X	X											

RELINQUISHED BY <u>1 Juan A. Lopez</u>	DATE <u>1/25/01</u>	RECEIVED BY <u>DB</u>	DATE <u>1.25.01</u>
FIRM <u>Herrera Environmental</u>	TIME <u>7:40</u>	FIRM <u>OSE</u>	TIME <u>7:45 am</u>
RELINQUISHED BY	DATE	RECEIVED BY	DATE
FIRM	TIME	FIRM	TIME

REVIEWED BY \_\_\_\_\_ DATE REVIEWED \_\_\_\_\_

COMMENTS:

Chromatographs with final report ☐



**OnSite  
Environmental Inc.**  
Analytical Testing and Mobile Laboratory Services

May 4, 2001

Bruce Carpenter  
Herrera Environmental Consultants, Inc.  
2200 6<sup>th</sup> Avenue, Suite 601  
Seattle, WA 98121

Re: Analytical Data for Project 491.55  
Laboratory Reference No. 0104-208

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on April 27, 2001.

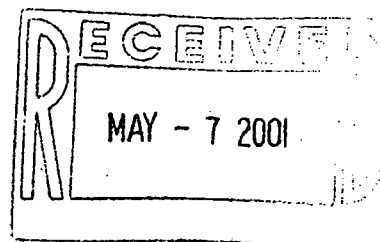
The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

  
David Baumeister  
Project Manager

Enclosures



Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: **FC5-8**  
Lab ID: 04-208-01

**FC6-8**  
04-208-02

	<b>Result</b>	<b>Flags</b>	<b>PQL</b>	<b>Result</b>	<b>Flags</b>	<b>PQL</b>
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	110		100
Surrogate Recovery:						
Fluorobenzene	74%			97%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 5-3-01  
Date Analyzed: 5-3-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC7-8  
Lab ID: 04-208-03

<sup>BAC</sup>  
FC8-~~78~~  
04-208-04

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	2.3		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	3.1		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	99%			98%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

NWTPH-Gx/BTEX

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC1-8  
Lab ID: 04-208-05

FC4-8  
04-208-06

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	ND		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	ND		1.0	ND		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	ND		100
Surrogate Recovery:						
Fluorobenzene	99%			95%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: <sup>BAC</sup> **FC9-38**  
Lab ID: 04-208-07

**FC2-8**  
04-208-08

	Result	Flags	PQL	Result	Flags	PQL
Benzene	ND		1.0	6.3		1.0
Toluene	ND		1.0	ND		1.0
Ethyl Benzene	ND		1.0	ND		1.0
m,p-Xylene	1.3		1.0	2.1		1.0
o-Xylene	ND		1.0	ND		1.0
TPH-Gas	ND		100	130		100
Surrogate Recovery:						
Fluorobenzene	97%			101%		



Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX**

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Client ID: FC3-8  
Lab ID: 04-208-09

	Result	Flags	PQL
Benzene	7.7		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery: Fluorobenzene	100%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Lab ID: MB0502W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100
Surrogate Recovery: Fluorobenzene	96%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX  
METHOD BLANK QUALITY CONTROL**

Date Extracted: 5-3-01

Date Analyzed: 5-3-01

Matrix: Water

Units: ug/L (ppb)

Lab ID: MB0503W1

	Result	Flags	PQL
Benzene	ND		1.0
Toluene	ND		1.0
Ethyl Benzene	ND		1.0
m,p-Xylene	ND		1.0
o-Xylene	ND		1.0
TPH-Gas	ND		100

Surrogate Recovery:

Fluorobenzene 94%

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX  
DUPLICATE QUALITY CONTROL**

Date Extracted: 5-2-01  
Date Analyzed: 5-2-01

Matrix: Water  
Units: ug/L (ppb)

Lab ID:	04-208-01 Original	04-208-01 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	74%	99%		

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Gx/BTEX  
MS/MSD QUALITY CONTROL**

Date Extracted: 5-2-01

Date Analyzed: 5-2-01

Matrix: Water

Units: ug/L (ppb)

Spike Level: 50.0 ppb

Lab ID:	04-208-01 MS	Percent Recovery	04-208-01 MSD	Percent Recovery	RPD	Flags
Benzene	55.6	111	55.9	112	0.59	
Toluene	54.7	109	55.1	110	0.62	
Ethyl Benzene	54.5	109	55.0	110	0.79	
m,p-Xylene	55.0	110	55.2	110	0.36	
o-Xylene	54.9	110	55.3	111	0.80	

Surrogate Recovery:

Fluorobenzene	98%	97%
---------------	-----	-----

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Dx**

Date Extracted: 4-27-01  
Date Analyzed: 4-27&5-1-01

Matrix: Water  
Units: mg/L (ppm)

	FC5-8	FC4-8	FC9-3 <sup>2</sup> Btc
Client ID:	FC5-8	FC4-8	FC9-3 <sup>2</sup> Btc
Lab ID:	04-208-01	04-208-06	04-208-07

Diesel Fuel:	ND	ND	ND
PQL:	0.25	0.25	0.25

Heavy Oil:	ND	ND	ND
PQL:	0.50	0.50	0.50

Surrogate Recovery:			
o-Terphenyl	108%	99%	95%

Flags: Y

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Dx**

Date Extracted: 4-27-01  
Date Analyzed: 4-27-01

Matrix: Water  
Units: mg/L (ppm)

Client ID: FC3-8  
Lab ID: 04-208-09

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 97%

Flags:

Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Dx**  
**METHOD BLANK QUALITY CONTROL**

Date Extracted: 4-27-01  
Date Analyzed: 4-28-01

Matrix: Water  
Units: mg/L (ppm)

Lab ID: MB0427W1

Diesel Fuel: ND  
PQL: 0.25

Heavy Oil: ND  
PQL: 0.50

Surrogate Recovery:  
o-Terphenyl 144%

Flags: Y



Date of Report: May 4, 2001  
Samples Submitted: April 27, 2001  
Lab Traveler: 04-208  
Project: 491.55

**NWTPH-Dx**  
**DUPLICATE QUALITY CONTROL**

Date Extracted: 4-27-01  
Date Analyzed: 4-27-01

Matrix: Water  
Units: mg/L (ppm)

Lab ID: 04-208-01 04-208-01 DUP

Diesel Fuel: ND ND  
PQL: 0.25 0.25

RPD: N/A

Surrogate Recovery:  
o-Terphenyl 108% 102%

Flags:



#### DATA QUALIFIERS AND ABBREVIATIONS

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- D - Data from 1:\_\_\_\_ dilution.
- E - The value reported exceeds the quantitation range, and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- G - Insufficient sample quantity for duplicate analysis.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical \_\_\_\_\_.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a silica gel cleanup procedure.
- Y - Sample extract treated with an acid cleanup procedure.
- Z -
- ND - Not Detected at PQL
- MRL - Method Reporting Limit
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference

# Chain of Custody

Company: Herrera Environmental

Project No.: 491.55

Project Name: Federal Center South

Project Manager: Bruce Carpenter

**Turnaround Request (in working days)**

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Day ☐ 3 Day

☒ Standard  
(Hydrocarbon analyses: 5 days,  
All other analyses: 7 days)

☐ \_\_\_\_\_  
(other)

Project Manager: BR

Laboratory No. 04-208

						Requested Analysis															
Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-DX	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C	PCBs by 8082	Pesticides by 8081	Herbicides by 8151A	Total RCRA Metals (8)	Priority Pollutant Metals (13)	TCLP Metals	VPH	EPH	% Moisture
1	FC5-8	4/26/01	935	W	4		X	X													
2	FC6-8		1045		2		X														
3	FC7-8		1125		2		X														
4	FC8-8 <sup>88</sup>		1215		2		X														
5	FC1-8		1310		2		X														
6	FC4-8		1335		4		X	X													
7	FC9-8 <sup>88</sup>		1445		4		X	X													
8	FC2-8		1610		2		X														
9	FC3-8		1625		4		X	X													

RELINQUISHED BY: <u>1 Sam A. Cap...</u>	DATE: <u>4/27/01</u>	RECEIVED BY: <u>[Signature]</u>	DATE: <u>4/27/01</u>	COMMENTS: <u>Sent Via Courier</u>
FIRM: <u>Herrera Environmental</u>	TIME: <u>845</u>	FIRM: <u>OnSite Env</u>	TIME: <u>12:45</u>	
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:	
FIRM:	TIME:	FIRM:	TIME:	
REVIEWED BY:	DATE REVIEWED:			

Chromatographs with final report ☐